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SCIENTIFIC AND TECHNICAL ACTIVITIES OVERVIEW

Summary of the Proposed 1995/96 Alberta Government Science and Technology Program and Budget and Three Year Plan

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Scientific and Technical Activities Overview Three Year Plan and Proposed Budget 1995 - 1996

Technology and Research Advisory Committee

Overview and Summary of the Proposed 1995/96 Alberta Government Research and Scientific Activities Program and Budget

MARCH 1995

TABLE OF CONTENTS

Contents i

Glossary 1

1. Preface 2
2. Executive Summary 3
3. Recommendations 6
4. Examples of Research Accomplishments 8
5. Highlights of the 1994-95 Research Plans. 11
6. Introduction 13
7. Findings 14
8. 1994/95 Research Programs by Economic Sector 19
9. 1994/95 Research Programs by Department or Agency 26
   - 9.1 Alberta Advanced Education 26
   - 9.2 Alberta Agriculture Food and Rural Development 29
   - 9.3 Alberta Agricultural Research Institute 49
   - 9.4 Alberta Community Development 63
   - 9.5 Alberta Economic Development and Tourism 80
   - 9.6 Alberta Energy 90
   - 9.7 Alberta Environmental Protection 101
   - 9.8 Alberta Health 124
   - 9.9 Alberta Heritage Foundation for Medical Research 136
   - 9.10 Alberta Research Council 141
   - 9.11 Alberta Transportation and Utilities 160

Appendix 1 - Participants in Overview Study 172

TABLE OF CONTENTS

Glossary

Science and Technology

Systematic activities that are closely concerned with the generation, dissemination and application of scientific and technical knowledge in all fields of science and technology. The central activity is research and experimental development (R&D). A number of activities closely related to R&D are termed related scientific activities (RSA). (UNESCO Definition)

Research and Development (R&D)

R&D covers all creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and includes the use of this stock of knowledge to devise new applications. New knowledge, products or processes are sought.

(OECD Definition: Frascati Manual)

Related Scientific Activities (RSA)

Those activities which complement or extend R&D by contributing to the generation, dissemination and application of new knowledge such as routine data gathering, and services provided by technical libraries. RSA includes activities such as technical and statistical surveys including those of exploration and systematic description of the earth and its natural resources, preparation of maps and survey reports, statistics on humankind, their economic and social activities, information services, and museum services. Information services directed recording, classifying, translating and disseminating scientific and technological information resulting from R&D are also included, however services directed toward the general public are excluded. Special services and studies directed toward the establishment of national or provincial standards for materials, devices, products and processes are also included as RSA

(Statistics Canada)

1. PREFACE

Increasingly, knowledge about science and technology (S&T) is needed to make everyday judgments and choices in business and everyday life. Technological advances are increasingly used in every aspect of our living. We see and experience its effects in our home, our recreation, our job, and our health care. There isn't a facet of our life and business that is not affected.

It has been stated *"The rate of technical change in a country and the effectiveness of companies in world competition in international trade in goods and services, depends upon the way in which the available resources are managed and organized both at the enterprise and national level. The national (*provincial*) system enables the country (*province*) to make progress through appropriate combination of imported technology and local development and adaptation."*

Seizing Opportunity, Alberta's economic development strategy identified that science and technology will be one of the main economic drivers of the 90s and beyond. Despite the recognition that Research and Development (R&D) is an engine of economic growth and a strong influence on social well being and health, promoters and funders of S&T are continually challenged to defend their investments against other seemingly important areas, as budgets are scrutinized and even reduced. Government research must be accountable to the public and must be appropriately managed in support of the broad social and economic objectives of the people it serves.

To meet this challenge the Alberta Government will need to increasingly focus its research and technology efforts to get maximum return for its investment and ensure that efforts are coordinated and utilized effectively to insure that we can meet the challenges of tomorrow. The Science and Research Authority was set up to provide this focus and has the responsibility of defining the strategic directions for the research and technology of the government.

This report prepared by the Technology and Research Advisory Committee (TRAC) describes the research and related scientific activities, plans, programs and proposed budgets for the 1995/96 fiscal year and the following two years. Strategic directions for these departments and agencies for the next five to ten years are also presented.

2. EXECUTIVE SUMMARY

This report prepared by the Technology and Research Advisory Committee (TRAC) presents an overview of the Alberta Government 1995/96 proposed research and development (R&D) and related scientific activities (RSA) of the 11 major performing and funding departments and agencies. The report also presents a plan of activities and budgets for three years and ten year strategic directions for the departments and agencies.

The 1995/96 science and technology (S&T) proposed investment by the departments and agencies is $165.98 million, which is composed of $103.12 million identified for R&D and the remainder for scientific activities such as surveys, library services for research, museum services and other related activities. Investment in scientific activities by the provincial government continues to drop from the peak in 1986 (as shown in figure 2.1) and accounts for a smaller percentage of the provincial government expenditure. Figure 2.2 shows how the gross provincial product and the provincial expenditures changed since 1982 as compared to investment in S&T activities.

Even though industry investment in research continues to grow the gross provincial expenditure on research (GERD), as a percentage of total Canadian research, has dropped from a high of 12% in 1981 to 7% in 1991.

Each of the departments and agencies identifies significant accomplishments in the past year's activities, providing examples of the economic and social impact of these accomplishments. The departments and agencies also present the processes used to develop their plans and the mechanisms in place to ensure that the programs meet the needs of the industrial or social sector they are serving. The departments and agencies also present the evaluation procedures used to determine the effectiveness of their programs.

FIGURE 2.1 ANNUAL INVESTMENT IN SCIENTIFIC ACTIVITIES

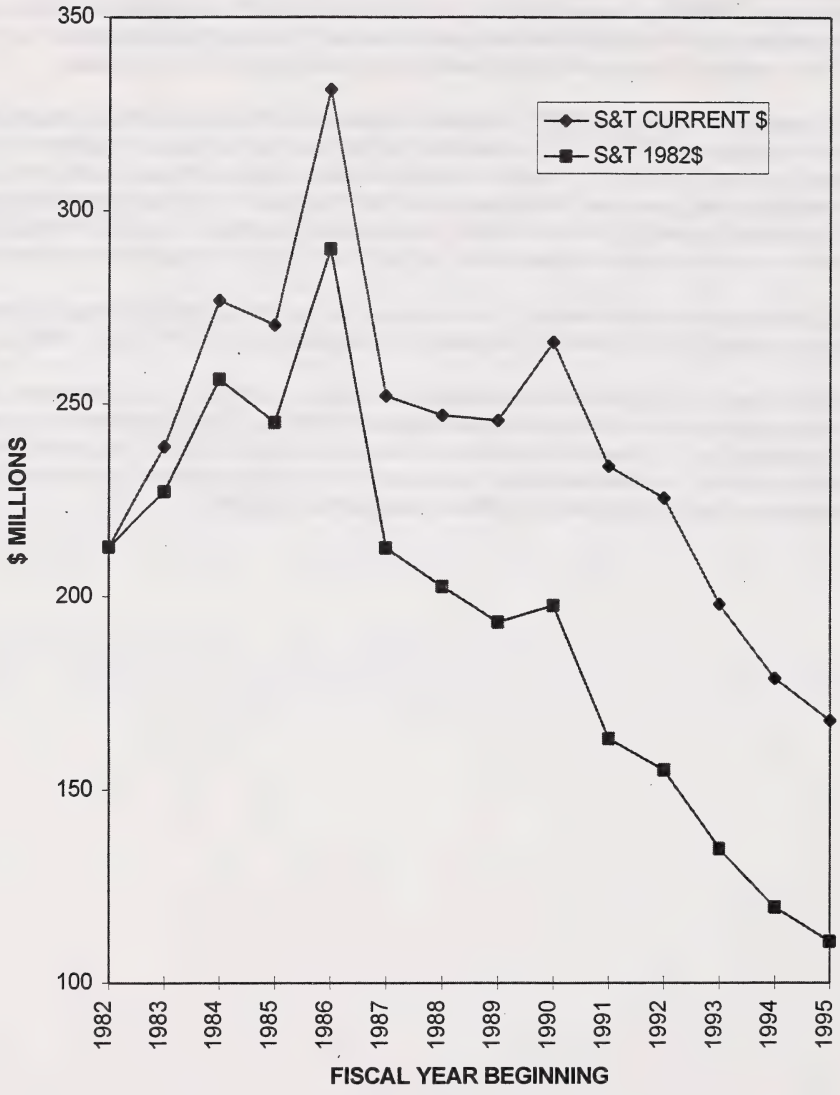
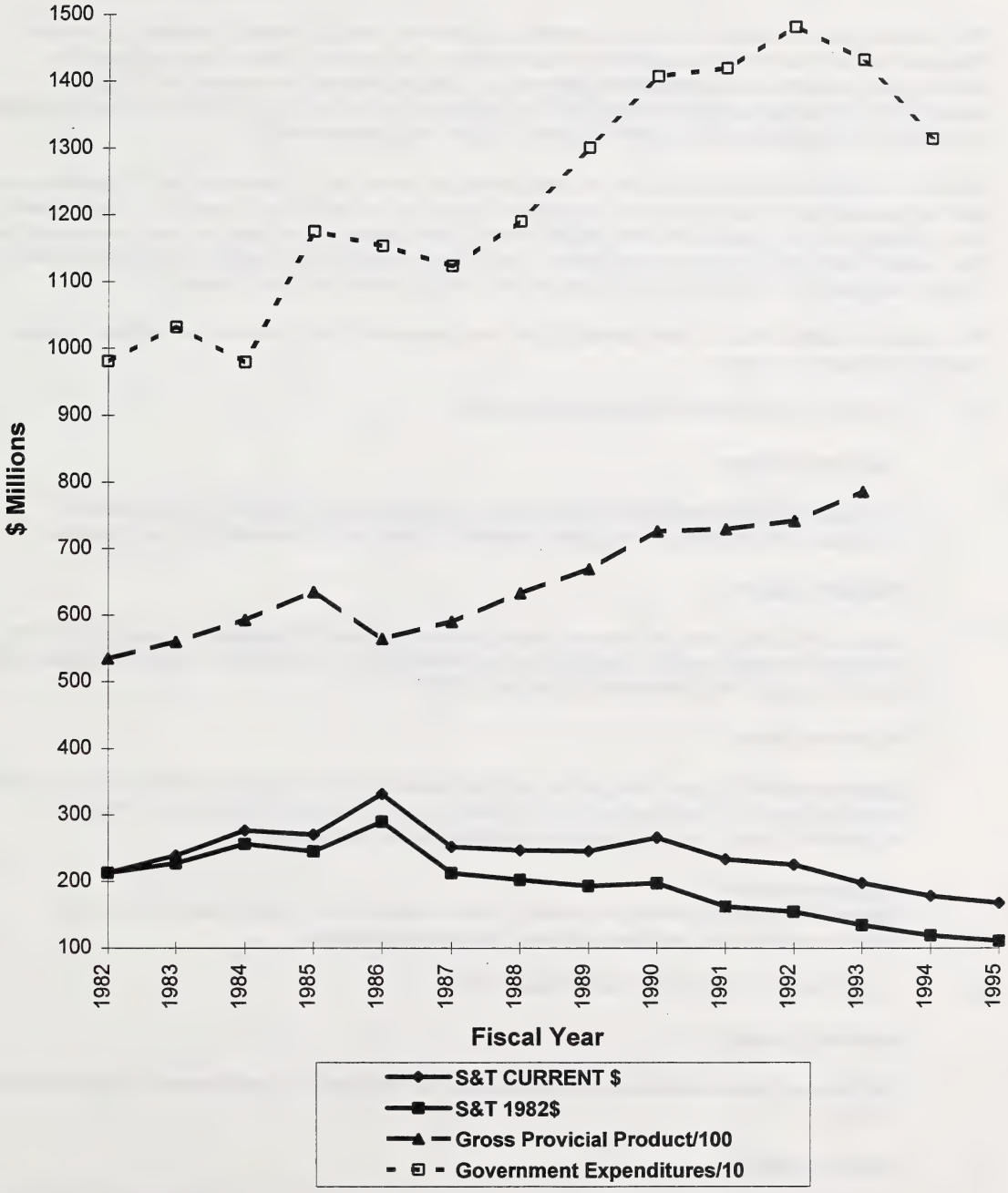


Figure 2.2 GPP, PROVINCIAL EXPENDITURES AND S&T INVESTMENT



3. RECOMMENDATIONS

The Technology and Research Advisory Committee supports the intent of the recently created Science and Research Authority and offers its support for implementation of its mandate. Much of the mandate of the Authority addresses the recommendations presented by TRAC in previous overview reports. TRAC recommends that as plans and priorities for S&T are addressed that the authority will quickly address the issues of funding and structural issues important to maintaining the critical research effort.

Stable and sufficient funding is necessary for effective research effort so that maximum use of collaboration and funding leverage can be used to achieve the expected results and to meet industry expectation. Departments and agencies work very closely with their industry stake holders and rely on the input and direction provided by their industry advisors to develop their programs. Any changes to this process must be done such that present industry participation and input are not jeopardized but in fact promoted and strengthened.

The recommendations made in previous reports are being addressed in part but overall are still valid and are reproduced in summary below.

3.1 SUMMARY OF 1993/94 RECOMMENDATIONS

Recommendation 1

The Alberta Government should develop a long-term Science and Technology (S&T) plan with strategies for implementation that clearly establish the priorities for its departments and agencies.

Recommendation 2

Each Alberta Department and Agency should develop long-term R&D plans with long and short term strategies for implementation, including the expected impact of the activities. Approvals for these plans should be sought through Request for Decision (RFD).

Recommendation 3

Departments and Agencies that perform and fund research should be given the ability to manage their funds over periods longer than one year by having approved rolling 3 to 5 year plans, with the requirement to carry forward surpluses and deficits into the following year.

Recommendation 4
Departments and Agencies should develop plans to ensure and maintain a high level of human resource capability and facilities to achieve their mission and goals.

3.2 SUMMARY OF 1992/93 RECOMMENDATIONS

Recommendation 1

The Alberta Government should make technology-based industrial competitiveness a major goal for this decade.

Recommendation 2

The Alberta Government should increase and maintain its research investment at $300 million per year.

Recommendation 3

The Alberta Government should put top priority on programs to substantially increase the industrial commitment to R&D.

4. EXAMPLES OF RESEARCH ACCOMPLISHMENTS

- Successful tests of the combination cyclic steam/steamflood heavy oil process developed with Norcen Energy Resources Limited and three other industrial partners were completed in the Bodo field with recovery of approximately 55% of the original oil in place from the enclosed central area of the pilot. Commercial use of the process will be contingent upon expectations of higher prices for heavy oil.

- The pre-commercial scale project, operated up to now by AOSTRA with nine industry participants, for production of bitumen from the Athabasca oil sands by the twin-well Steam Assisted Gravity Drainage (SAGD) Process has reached its designed capacity of 2000 barrels per day. Business arrangements are being pursued for an industry operator to replace AOSTRA, and it is expected that a private company will lead the project through to commercialization.

- Research supported at the University of Alberta has produced seminal discoveries in the area of fluid dynamics that have a tremendous practical impact on the process by which bitumen is recovered from the Alberta oil sands.

- "High Resolution Digital Teradiology" and new communications procedures being developed at the University of Calgary could transmit medical images such as X-rays from isolated health-care centres to more advanced urban facilities, reducing costs of transporting patients to advanced health care facilities.

- Discovery that damaged nerve cells of animals can recover in cell cultures, paving the way for advances in therapy for Alzheimer's disease and other neurological conditions.

- Through the Alberta Mental Health Research Fund measures were developed that are currently being used across North America to investigate developmental motor problems in children with clinical assessment instruments for assessing child and family psychopathology. This will result in more effective treatment in the area of child psychopathology, and group treatment for schizophrenics.

- Canola research has already paid dividends as demonstrated from the success of canola in the marketplace. The benefits of the research efforts have become particularly apparent in 1994. This year, canola will emerge as the leading cash crop for the first time in the history of the province.

- Early stages of commercialisation were completed for an electric glove for paralysed people, a device to test hearing, a brain-imaging device, a diagnostic test for whooping cough, and other innovations.

- A new design and installation procedure using a concrete slab and culvert reduces the need for overdesign and promises cost effectiveness without compromising safety.

- An integrated global positioning system(GPS) and videolog system capable of recording high resolution roadway pictures that are accurately tagged to a GPS location reference system was developed that will save time and costs in planning, design and operational analyses.

- Research has revealed that micronutrient deficiency is a major cause of low crop yields, particularly for spring wheat, barley and oats. Several million acres exhibiting micronutrient deficiencies, mainly copper, have been identified in the province with economic loss to Alberta producers estimated to be in the tens of millions of dollars. Complex interactions in terms of crop stress, disease, herbicide and fertilizer response are being assessed and diagnostic methods for confirming the cause of the problem are being assessed to address the problem.

- A hulless barley variety developed through the department's research effort is now giving a significant advantage to Alberta's livestock industry. Because the digestibility of protein in this variety is higher than other sources, the level of nitrogen in livestock waste is reduced. This lessened the environmental impact of livestock wastes on surface and ground waters. This variety is also creating interest in Pacific Asia for its value as human food.

- Fibrinogen, a protein extruded from an animal by-product was developed as a bonding agent in meat processing. This process has led to the establishment of F.N.A. Foods Inc. in Alberta. The company began construction of a $2.5 million plant in Strathmore in August, 1994 to produce Fibrimex, a commercial product based on the Fibrinogen work done at the Food Processing Development Centre

- A railcar allocation program called RADSS using genetic algorithm search techniques was developed. In 1993/94 RADSS improved the throughput of Alberta (Wheat) Pool's transportation network at an estimated value of $1M. There appears to be greater impact this year. To date, a license has been granted to the Saskatchewan Wheat Pool for $130K with a $40K annual maintenance fee.

- Utilization and disposal of pulp mill sludge from a bleached chemi-thermomechanical pulp (BCTMP) in field trials on agricultural land have demonstrated both moisture retention benefits and fertilizer benefits. Farmers around pulp mills will benefit from a lower cost fertilizer and the mills will reduce landfill costs by about $250,000/year.

- NOxSMART, a realtime expert system prototype for the control of NOx emissions in coal-fired power plants developed with Monenco/AGRA for TransAlta Utilities will be fully deployed by TransAlta Utilities at their Keephills power generation site. From tests done during the prototype development, NOxSMART is expected to contribute a 10-20% reduction of NOx emissions with no major refit required to the burners.

- A value-added processed potato product containing meat was developed for test market evaluation in Japan.

- North America's first "green" panelboard produced from materials normally dumped in landfills was developed without the use of conventional Urea Formaldehyde resins. Construction of a 60 million square foot medium density fibreboard plant is scheduled for December 1994.

- New product and packaging technology developments have made Alberta a leader in the development and utilization of an innovative food packaging technology called MAP (Modified Atmosphere Packaging). This technique has resulted in marked improvement in the quality, safety and life of perishable food, particularly meats, and has opened new export market opportunities for Alberta products.

- Seven PressMAN systems have been sold this year at an average cost of $25,000 each. In addition to selling the systems, Forest Products personnel have been contracted to demonstrate the PressMAN system at over 12 commercial mills across North America this year. This has resulted in positive exposure for the Forest Products PressMAN and ARC is recognized around the world in the panel industry. As a result, industry is looking to Alberta for their R&D needs and also as a location for new mills.

- Petrovalve International has designed a guided valve which involved development of wear and corrosion resistant materials and coatings used in pumping crude oil. There have been 36 jobs created with sales exceeding $2.5 million annually. Exports to Venezuela are approximately $1 million.

- The Alberta Research Council has worked with Weyerhaeuser and Alberta Economic Development in increasing the utilization of alternate species for OSB production. Over the past five years, species such as black poplar, black spruce, white spruce and birch have been investigated in the pilot plant; followed by a mill trial. As a result of this work, Weyerhaeuser utilize approximately 30% alternate species in their normal production. This has reduced Weyerhaeusers' cost for wood and also extended their wood resource.

- The Royal Tyrrell Museum celebrating its 10th anniversary in 1995, has gained an international reputation for the quality of its fossil displays, extensive collections, attractive buildings, the appropriateness of its badlands setting and the contribution of its scientists to advancing the field of palaeontology.

5. HIGHLIGHTS OF PROPOSED1995-1996 RESEARCH PROGRAM

- The use of hydraulic mining and ore transport in conjunction with new extraction processes will be pursued as a means of reducing overall costs of producing oil from the Oil Sands.

- Support will continue for the use of steam, combustion and immiscible carbon dioxide ($C0_2$) recovery as means of improved recovery of heavy oil. Increased use of recovery processes using horizontal wells will also be supported.

- A study and stakeholder discussions will lead to the development of a policy framework for university research. Such a policy framework will assist the department and the universities in analyzing and taking account of the research function (as distinct or complementary to the teaching function) especially as it may relate to new and important departmental initiatives such as the implementation of accountability measures and a new funding system.

- Pioneering work in areas such as: heart attack therapy, transplantation of insulin-producing cells for diabetics, nerve regeneration, cholesterol studies, the cell biology and genetics of cancer, drugs for viral infections including hepatitis B and Chronic Fatigue Syndrome, electrical therapy for paralysed people, vaccine development for malaria, meningitis, and diabetes, improved understanding of arthritis, causes of high blood pressure, diagnostic tests for ulcers, lupus, knee injury, cancer, and other conditions.

- Improve the economic performance of companies developing products for computer system integration in general and for use in areas such as transportation logistics, health care, training and education.

- Specialised research and patient care clinics for Alzheimer's disease, lupus, joint injuries, diabetes, thyroid disorders, cancer, heart disease, multiple sclerosis, hearing disorders, neonatal medicine, and other conditions.

- A comprehensive study to completely characterise the immediate, short term and long term impact of biochemical oxygen demand constituents from pulp mill effluents on the surface water quality of receiving streams.

- Study the impacts and benefits that result from psychotherapy treatment to breast cancer patients. It aims to demonstrate that patients with breast cancer who receive a psycho-therapeutic intervention will show improved coping skills and less stress, and also change the way they use health care resources.

- Research assistance to companies for product development and application and use of new and improved processes, and materials. Improving the productivity of Alberta manufacturers through better use of diagnostics, and assessment and implementation of a variety of advanced manufacturing and information technologies.

- Collaborative applied research, analytical service and technical development projects to characterise the impact of pests and pest management practices on the environment and to develop safe and economically acceptable pest management practices.

- Research on microbiological processes in waste management involving experimental work on chromium removal from industrial wastes using bioreactors, performance assessment of on-site domestic wastewater treatment technology, and the detection and quantification of odorous compounds of microbial origin associated with piggery waste.

- Research and information development in forages will be increased to improve feed quality, reduce per unit production costs and promote exports.

- Livestock research in animal health, disease prevention, surveillance, detection and treatment to enable the industry to be more competitive and help the department to properly carry out its regulatory duties and maintain animal health standards designed to protect the safety and quality of the food supply.

- The Provincial Museum of Alberta will be hosting "CARNOSAURS", a large display of robotic flesh eating dinosaurs. This exhibition will have a heavy educational programming component.

- Commercialization of presure swing absorbance(PSA), hollow fibre and permeation gas separation technologies through development contracts and licensing agreements for individual applications and uses of the technology.

- Establish a capability for the manufacture of clinical trial material under GMP regulations for the biopharmaceutical industry.

- A study into the combination of polymer and wood fibres to produce a pulp that would be used for the production of high strength paper.

6. INTRODUCTION

This fourth annual Scientific and Technical Activities Overview and Budget is prepared to assist in the definition and implementation of the 1995/96 research and technology programs. This year's report is expanded to include three year research plans for the departments and agencies including long term strategic directions. The departments and agencies were asked to include plans for more detailed ongoing program evaluation plans and the processes used to plan and coordinate their programs with other departments, agencies, federal departments and industry.

The report is structured to address the following major points:

1. The mandate and mission of the department and the way the research activities are structured to meet the industry needs and opportunities.

2. Three and ten year strategies and key success factors.

3. Programs, products and services.

4. Measurable results and accomplishments.

5. Resource requirements.

6. Implementation plans.

7. Financial plans.

The recent establishment of a Science and Research Authority and an Economic Development Authority to identify strategic priorities for the province address key areas of concern identified by TRAC in their previous reports. It is hoped that close cooperation of the two Authorities will help to define a Science and Technology plan with strategies that mesh with economic and social development plans of the province. A clear definition of the Provincial strategy will be invaluable in the development of longer term sector research and development strategies and plans by the departments and agencies.

7. FINDINGS

1. The departments report on their proposed research activities to support the industry development in the province and for the first time outline an on-going three year plan with a longer term strategic direction for their programs.

2. The investment in research and development (R&D) and related scientific activities (RSA) continues to drop, with an estimated drop of over 10 million from 1994/95. The S&T investment for 1995/96 is projected to be 165.98 million (Tables 7.1,7.2 and 7.3) which is made up of $ 103.12 million for R&D and the remainder for related scientific activities. (The estimate for 1993/94 is made during the course of the year and is provided for comparison purposes only. The figure for "other departments" is particularly difficult to estimate. For the first time the figures for 1993/94, 1994/95, and 1995/96 include funds from Lotteries and Gaming.)

3. The departments outline significant accomplishments from the investment in S&T activities, identifying the economic and social effects resulting from the exploitation of these results.

4. The departments and agencies fund or collaborate in R&D projects with other departments and agencies, industry and federal institutions to maximize their effort and return on the projects. Most of these investments generate at least an equal investment from industry and other governments. Departments are increasingly focusing on projects that provide higher leverage.

5. There is a need for stable funding for research programs to maximize the return on the investment through leverage in funding by industry and in cooperative and collaborative efforts in these programs. Research programs by their nature are longer term and thus require multi-year commitments of funding to gain the cooperative effort from other parties.

TABLE 7.1 SCIENTIFIC ACTIVITIES BUDGET[1]

($ millions)

Department/Agency	1991/92 Actual	1992/93 Actual	1993/94 Actual	1994/95 Estimated	1995/96 Proposed	1996/97 Proposed	1997/98 Proposed
Alberta Agriculture, Food and Rural Development	16.02	14.44	17.15	18.96	18.46	17.93	18.23
Alberta Agricultural Research Institute	5.85	5.86	5.71	7.26	6.84	6.04	5.86
Alberta Energy(and AOSTRA)[5]	30.94	26.82	30.72	18.93	19.17	18.79	18.66
Alberta Research Council	27.41	27.98	24.80	22.55	21.04	19.53	19.53
Alberta Environmental Protection	48.50	53.55	30.68	34.89	24.85	23.93	23.93
Alberta Health	5.49	6.25	6.27	6.44	6.88	6.88	6.88
Alberta Heritage Foundation for Medical Research (AHFMR)	28.27	28.13	26.06	30.00	29.00	29.00	29.00
Alberta Economic Development & Tourism	23.17	22.68	19.17	8.58	7.19	6.94	5.54
Alberta Transportation & Utilities	6.86	7.68	6.85	6.95	5.70	5.45	5.45
Alberta Community Development	21.65	20.81	18.05	14.81	14.33	13.70	13.70
Other Departments & Agencies[2]	19.60	15.08	12.52	12.52	12.52[3]	12.52[3]	12.52[3]
TOTAL	**233.76[4]**	**229.28[4]**	**197.98[4]**	**177.01[4]**	**165.98**	**160.71**	**159.40**

[1]Alberta Advanced Education and Career Development provides vital funding for operational and infrastructure support for R&D at Alberta Universities, estimated to be roughly **$189 million**. Such contributions to infrastructure are not normally included in R&D investment statistics. Alberta Universities perform approximately one-third of the provincially funded R&D through grants and contracts from the departments and agencies.

[2] Includes AADAC, Access Network, Career Development, Education, Environment Council, Justice, Labour, Treasury, and Lotteries and Gaming. Most of these activities are RSA.

[3]Projected from the 1993/94 investment estimate and includes projected revenue for some departments internally generated through sales but not included in the figures above.

[4]These figures include some funds obtained through sales, contracts and grants from the federal government.

[5]Alberta Energy will administer and fund the Geological Survey from 1995/96 onward. It was previously jointly funded with the Alberta Research Council.

TABLE 7.2 PROPOSED 1995/96 SCIENTIFIC ACTIVITIES BUDGET[1]

($ millions)

Department/Agency	1995-96 Proposed R&D	RSA	TOTAL
Alberta Agriculture, Food and Rural Development	9.70	8.76	18.46
Alberta Agricultural Research Institute	6.24	0.60	6.84
Alberta Energy(and AOSTRA)[4]	17.45	1.72	19.17
Alberta Research Council	21.04	---	21.04
Alberta Environmental Protection	7.15	17.70	24.85
Alberta Health	5.01	1.87	6.88
Alberta Heritage Foundation for Medical Research (AHFMR)	29.00	---	29.00
Alberta Economic Development & Tourism	6.55	0.64	7.19
Alberta Transportation & Utilities	0.98	4.72	5.70
Alberta Community Development	---	14.33	14.33
Other Departments & Agencies[2]	---	12.52	12.52[3]
TOTAL	**103.12**	**62.86**	**165.98**

[1]Alberta Advanced Education and Career Development provides vital funding for operational and infrastructure support for R&D at Alberta Universities, estimated to be roughly **$189 million**. Such contributions to infrastructure are not normally included in R&D investment statistics. Alberta Universities perform approximately one-third of the provincially funded R&D through grants and contracts from the departments and agencies.

[2] Includes AADAC, Access Network, Career Development, Education, Environment Council, Justice, Labour, Treasury, and Lotteries and Gaming. Most of these activities are RSA.

[3]Projected from the 1993/94 investment estimate and includes projected revenue for some departments internally generated through sales but not included in the figures above.

[4]Alberta Energy will administer and fund the Geological Survey from 1995/96 onward. It was previously jointly funded with the Alberta Research Council.

TABLE 7.3 PROPOSED 1995/96 FUNDING BY ECONOMIC AND SOCIAL SECTOR

	R&D	RSA	TOTAL
		($ million)	
Agriculture and Food			
Alberta Agricultural Research Institute	6.24	0.60	6.84
Alberta Agriculture, Food and Rural Development	9.70	8.76	18.46
Total	**15.94**	**9.36**	**25.30**
Petroleum and Gas			
Alberta Energy	12.17	1.13	13.30
Alberta Research Council	3.37	--	3.37
Total	**15.54**	**1.13**	**16.67**
Coal and Hydrogen			
Alberta Energy	1.60	0.59	2.19
Alberta Research Council	1.97	--	1.97
Total	**3.57**	**0.59**	**4.16**
Other Energy and Mineral			
Alberta Energy[3]	3.68	--	3.68
Total	**3.68**	**--**	**3.68**
Forestry and Land Information			
Alberta Environmental Protection	1.52	13.41	14.93
Alberta Research Council	0.60	-	0.60
Economic Development and Tourism	0.60	0.20	0.80
Total	**2.72**	**13.61**	**16.33**
Health Care and Medical			
Alberta Health	5.01	1.87	6.88
Alberta Heritage Foundation for Medical Research	29.00	--	29.00
Alberta Economic Development & Tourism	0.20	-	0.20
Total	**34.21**	**1.87**	**36.09**

TABLE 7.3 PROPOSED 1995/96 FUNDING BY ECONOMIC AND SOCIAL SECTOR

	R&D	RSA ($ million)	TOTAL
Manufacturing			
Alberta Economic Development & Tourism	2.05	0.09	2.14
Alberta Research Council	11.50	-	11.50
Total	**13.55**	**0.09**	**13.64**
Transportation			
Alberta Transportation & Utilities	0.98	4.72	5.70
Total	**0.98**	**4.72**	**5.70**
Environment			
Alberta Environmental Protection	5.63	4.30	9.93
Alberta Research Council	3.60	--	3.60
Total	**9.23**	**4.30**	**13.53**
Infrastructure & Other			
Alberta Community Development	--	14.33	14.33
Alberta Economic Development & Tourism	3.70	0.35	4.05
Other Departments & Agencies[1]	---	12.52	12.52
Total	**3.70**	**27.20**	**30.80**
TOTAL	**103.12**	**62.86**	**165.98**[1]

[1] Estimated from 1993/94 investment.

[2] Alberta Advanced Education provides vital funding for operational and infrastructure support for R&D at Alberta Universities, estimated to be roughly $184 million. Such contributions to infrastructure are not normally included in R&D statistics.

[3] Alberta Energy will administer and fund the Geological Survey from 1995/96 onward. It was previously jointly funded with the Alberta Research Council.

8. 1995-1996 RESEARCH PROGRAM - BY ECONOMIC SECTOR

As programs are examined and re-evaluated with respect to provincial economic and social plans and budgets the science and technology programs must similarly be evaluated relative to overall objectives and contribution to the economy. Research and scientific activities are important investment areas that are necessary to ensure ongoing development of our wealth generating activities and social welfare. Figure 8.1 shows the percentage contribution in the past decade to the Gross Provincial Product (GPP) of the economic sectors. Many players contribute to the overall research programs and activities and these must be coordinated to ensure maximum benefit of these programs. These efforts are summarised below according to sectors to show the many players.

Agriculture and Food

Major Participants

- Alberta Agriculture, Food and Rural Development
- Alberta Agricultural Research Institute
- Alberta Research Council
- Alberta Environmental Protection
- Alberta Universities

The agriculture and food sector continues to be one of Alberta's major source of employment and income. The sector continues to be an important contributor to economic activity with the primary agricultural sector (excluding the related food processing and other manufacturing activities) growing by over $500 million in contributions to the GPP and almost 15% employment growth since 1985. The investment in the development of new varieties of crops and animals has paid off in keeping Alberta's farmers competitive and increasingly productive. The total value of the sector's annual shipments are estimated at $5 billion.

Agriculture products including food and beverages accounted for 15% of Alberta exports in 1992. Alberta's annual earnings from out-of-country exports of primary and processed food products exceed $3 billion while sale to other parts of Canada is about $1.5 billion.

The total value of processed agricultural products continues to grow steadily and is estimated at $4.9 billion in 1992. The food and beverage manufacturing sector in Alberta represents over 12% of provincial exports.

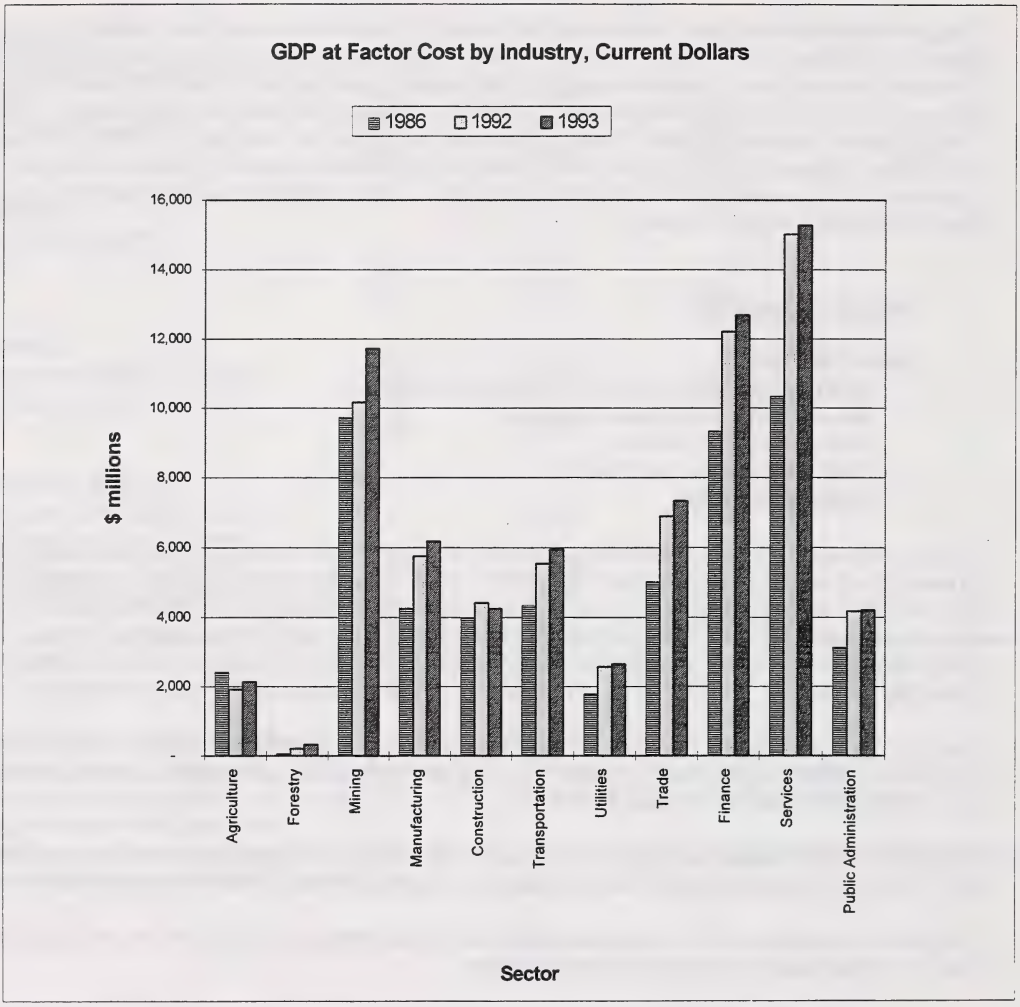
The agri-food industry is built on the results of science and technology. The 1995/96 provincial agri-food research program has a range of objectives, including:

1. In cooperation with industry, conduct research in targeted areas to generate relevant leading-edge information and technology.

2. Collect, collate, evaluate and adapt to Alberta conditions new research results and technology from around the world.

3. Encourage greater private sector involvement in funding and conducting research.

FIGURE 8.1


GDP at Factor Cost by Industry, Current Dollars
1986
1992
1993
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
$ millions
Agriculture
Forestry
Mining
Manufacturing
Construction
Transportation
Utilities
Trade
Finance
Services
Public Administration
Sector

The following represent program areas of major concentrations in the department's research effort:

- crops,
- livestock,
- processing,
- engineering,
- economics and marketing, and
- land and water.

The scientific results obtained from research will be used to meet both industry needs and the department's regulatory requirements.

Alberta Agriculture, Food and Rural Development and the Alberta Agricultural Research Institute (AARI) are the leading funders of agricultural and food research and are the focus in the province for coordination and planning of the provincial investment in these research programs. Other provincial participants include Alberta Environment, the Alberta Research Council and the University of Alberta.

Energy and Other Minerals

Major Participants

- Alberta Energy
- Alberta Research Council
- Alberta Universities
- CANMET

Petroleum

As conventional oil reserves decrease in Alberta and public attentions to environmental concerns increase, technological developments become increasingly important to the energy and minerals industry in Alberta. With the economic realities of the past 6 or 7 years of low oil prices, the competitiveness of the Alberta industry can largely be attributed to the application of technological developments that occurred in the past two decades.

As conventional oil reserves decrease in Alberta, the relative importance of the four oil sands deposits increase. The major part of the Alberta Government research investment in this sector reflects this shift in priority. Alberta Energy and the Alberta Research Council are the two major provincial government bodies responsible for oil sands research with Alberta Energy and Alberta Environment activity involved in supporting research activities.

Specific Objectives

- confirm the superior performance projected for the twin-well steam assisted gravity drainage process for bitumen recovery, in tests in a commercial scale production pattern with underground access in the Athabasca deposit continuing to the end of 1996;

- extend the concept of the twin-well steam assisted gravity drainage process to wells drilled from the surface, in all three major oil sands deposits;

- demonstrate the AOSTRA-TACIUK Process (ATP) recovery technology in a mined oil sands application;

- develop technology which will substantially reduce the cost of converting raw bitumen to transportation fuels;

- maintain ongoing activities in technology transfer, institutional research, and information dissemination in the oil sands, heavy oil, and enhanced recovery areas;

Coal

Alberta's coal industry continues to be an important energy source with production over 35 million tonnes annually. Its 12 major coal mines produce three types of coal for the domestic and export markets. Today's market conditions make it essential that producers use the most efficient and economical technologies available in exploration, production, preparation, upgrading, transportation and marketing.

Alberta's coal industry will continue to supply the low-sulphur coal that makes electricity available to all Albertans at low cost and minimal environmental effects.

A key research objective is to develop clean coal-burning technologies for long-term, environmentally acceptable and safe use of coal as the fuel of choice for generating electricity.

Objectives for this year are:

- Develop clean coal-burning technologies to permit the long-term, environmentally acceptable use of coal as the fuel of choice for electricity generation, in particular emissions from coal production, handling and use. The special interests of the utility companies are the reduction of particulates, $S0_x$, $N0_x$, any potential toxic elements and solid and liquid waste streams.

Hydrogen

The presence of substantial amounts of hydrogen in Alberta's sour gas resources is a potential source that could allow recovery of hydrogen, which is a highly valued product that is being used increasingly in the energy industry.

Program objectives are:

- Increase the competitiveness of Alberta's industry by lowering the cost of hydrogen through new or more efficient hydrogen generation, transportation and use.

- Promote the expansion of Alberta's petroleum industry by developing hydrogen technologies to increase the hydrogen-to-carbon ratio of Alberta's fossil fuels and meet present and future environmental requirements.

- Diversify Alberta's economy by developing new commercial use of hydrogen that will build on Alberta's resource industry and broaden the provincial industrial base.

Alternative Energy

Renewable solar and wind energy resources of southern Alberta show promise of being used on a large scale.

Program Objectives are:

- to develop and demonstrate technologies for exploiting Alberta's solar, wind and hydro resources

Other Minerals

Alberta possesses numerous deposits of valuable minerals whose full commercial impact has not yet been identified and characterised. The development of all these non-renewable, renewable and non-energy resources can contribute enormously to the diversification and growth of Alberta's resource industry.

A major objective is to:

- further develop Alberta's metallic and industrial minerals industries;

- increase the productivity of these industries;

- improve the quantity and availability of mineral related geoscience data; and

- replace imported minerals with locally mined minerals where possible.

Health Care

Major Participants

- Alberta Health
- Alberta Heritage Foundation for Medical Research(AHFMR)

AHFMR will support research programs to ensure that Albertans have access to first class health care. Other contributing departments and agencies include: Alberta Economic Development and Tourism, Alberta Foundation for Nursing Research, the Alberta Research Council and Alberta Environmental Protection.

The increasing cost of health care is receiving considerable attention. Programs are identified to address development of new and improved treatments to improve the health and productivity of Albertans and to decrease the cost of treatment and care.

Key programs include:

1. Clinical and basic research in areas such as heart disease and cancer.

2. Basic, clinical and health service research on issues relevant to mental health with the objective of improving the mental health of Albertans.

3. Explore causes of learning and attention disorders including genetics.

4. A focus on health service outcomes in terms of effectiveness of health services.

5. Basic and clinical research in heart attack therapy, transplantation of insulin - producing cells for diabetics, nerve regeneration, viral infections including hepatitis B and Chronic Fatigue Syndrome.

6. Specialised care for Alzheimer's disease, lupus, etc.

Manufacturing

Major Participants

- Alberta Economic Development and Tourism
- Alberta Agriculture, Food and Rural Development
- Alberta Research Council

Alberta Economic Development and Alberta Research Council collaborate in a broad range of programs to support and enhance the manufacturing activities in Alberta and to provide the necessary support to industry to develop and commercialize new products and processes.

Transportation and Utilities

Major Participants

- Alberta Transportation and Utilities
- Alberta Universities

Alberta Transportation and Utilities will carry out a variety of programs to improve the cost effectiveness of Alberta's transportation system. The programs focus on:

- improvement in the design, maintenance and operation of the highways, roads, bridges and airport

- in cooperation with the universities long term research on the performance of pavement, bridge structures and hydraulics

- in cooperation with national and international agencies, research into asphalts, pavement performance, concrete structures, highway maintenance programs

Environment

Major participants

- Alberta Environmental Protection supported by many Alberta government departments and agencies

Alberta was the first province to establish a department of the environment (1917), and scientific studies commenced shortly thereafter. Many baseline studies have been completed, which have formed the framework to guide ongoing economic development.

The 1980s saw a large number of environmentally related initiatives, by both the government and industry. A Clean Air Strategy was developed which helped set regulations and standards. The first hazardous waste management plant in North America was constructed at Swan Hills. Alberta became a leader in understanding the effects of acid rain, land reclamation, prediction of severe storms, air quality prediction, and removal of sulphur from stack gases. These are just a few of many major accomplishments.

Key program elements include:

- toxicology studies on natural and man made substances
- restoration of disturbed, degraded or contaminated lands
- protection of plant and animals from pests and diseases
- development of sound waste management strategies
- preservation and enhancement of the quality of Alberta's water resources
- provision of analytical and diagnostic environmental services

Environmental concerns are one of the major impediments to growth of our economy. Alberta's environmental research programs will provide the basic scientific data to ensure optimum development of our social and economic resources.

Research Infrastructure

- All departments and agencies support research infrastructure in their areas of responsibilities.
- Such infrastructure is sector specific, costly and beyond the reach of most companies.
- Industry normally provides considerable financial and technical support.

Examples include:

- Alberta Environmental Protection
  - Alberta Environmental Centre
- Alberta Agriculture, Food and Rural Development
  - Research Facilities such as The Food Processing Development Centre
- Alberta Energy
  - -Renewable Energy Facilities, Major Field Pilots, Underground Test Facility
- Alberta Research Council
  - Biotechnology Pilot Plant, Electronics Test Centre, Wood Products Test Facility
- Alberta Heritage Foundation for Medical Research
  - Two major medical research facilities, the Alberta Universities Research facilities
- Alberta Economic Development and Tourism
  - Various advanced technology institutes, such as TRLabs, The Laser Institute, Alberta MicroElectronic Centre, High Performance Computing, Westaim
- Alberta Culture and Multiculturalism
  - Royal Tyrrell Museum, Reynolds Museum,
- Alberta Advanced Education
  - The Alberta Universities Research Facilities

9. 1995-1996 RESEARCH PROGRAM BY DEPARTMENT AND AGENCY

9.1 Alberta Advanced Education and Career Development

9.1.1 Role of Advanced Education and Career Development

Unlike other government of Alberta departments and agencies which either fund or perform research, Alberta Advanced Education and Career Development's function is relevant in this context because it funds the research infrastructure at Alberta universities. Advanced Education and Career Development's contribution to this document is different, in both format and content from funding or performing departments and agencies. The nature of our submission reflects our unique role.

9.1.2 Role of University Research

Research performed at Alberta universities adds to the general stock of knowledge on which social, economic, and scientific/technical progress is made. The performance of basic research is also critical to the training of highly qualified manpower.

Alberta's universities are major performers of research and development funded directly through grants and contracts by the province ($31.4 million in 1992-93). The province also benefits from the research conducted at Alberta's universities funded by federal government sources (over $73 million in 1992-93). Research conducted at the universities helps provide the knowledge required to help ensure the long term viability of the province's major industries whether through the application of knowledge to natural resource industries such as energy, forestry or agriculture, in the emerging medical and biological fields, or in the various high technology areas.

9.1.3 1993-94 Accomplishments

During fiscal year 1993-94, Alberta's two major research universities, the University of Alberta and the University of Calgary, brought in substantial levels of extramural research support. At the U of A during fiscal year 1993-94, $87.2 million in external funding for sponsored research was received. $44.6 million of this sum was received from federal sources - benefiting Albertans and the Alberta economy. The U of C received more than $60 million in sponsored research funding, of which $38.8 million was from federal government sources. Between the U of A and the U of C alone, approximately $147.4 million was received from external sources, with $83.4 million coming to the province from federal sources. Alberta Advanced Education and Career Development, during fiscal year 1993-94, paid to Alberta's three residential universities (the U of A, the U of C, and the U of L) grants totaling $475.5 million, of which 40% or $190.2 million can be seen as supporting the research infrastructure.

Among the range of research carried out at Alberta universities during the fiscal year 1993-94, the following illustrate the range of projects carried out:

1. Janice Lander, Faculty of Nursing at the U of A, studies the management of pain in patients, with particular emphasis on children. Her work extends into the realm of anesthesia, where she and her colleagues study ways to minimize the sensation of pain. Another aspect of her work is concerned with the expectation and subsequent memory of pain. By "taking the jab out of needles", Dr. Lander's work makes pediatric patients much less anxious about being poked and about returning to the clinic for follow-up treatment.

2. The burning of coal for power-generating stations produces millions of tons of fly ash as a major by-product. Doctors David Chanasyk and Anne Naeth of the U of A have looked at two problems related to this: what to do with fly ash, and what to do about reclaiming the fields that were left with poor quality topsoil? Their work has resulted in fly ash being used as a soil amendment, further work on water management in mines, and tilth research into the value of manure as a soil amendment. This research, with its effective follow-up in public workshops and site tours, is an excellent example of valuable and beneficial partnering among industry, agriculture and university-based scientists.

3. At the U of A, Department of Chemical Engineering, Jacob Masliyah's specific research interests concern the mechanics of flowing particles and fluids. From pursuit of this fundamental work, he has made several seminal discoveries in the area of fluid dynamics that have had tremendous practical impact on the process by which bitumen is removed from the Alberta oil sands. The hot water process for bitumen extraction involves several steps, including initial treatment of the oil sands in a tumbler, extraction in a primary separation vessel, floatation, and processing of the tailings. Dr. Masliyah's research on the properties of fluids has had a major impact on each of these steps.

4. A large-scale study by the Canadian Research Institute for Law and Family (CRILF) at the U of C, contains a wealth of information about Alberta youth and substance abuse, including new information about family, demographic and peer-pressure factors.

   The study queried 2,118 students between 12 and 18 years of age at schools throughout Alberta. It was conducted in cooperation with the Premier's Council in Support of Alberta Families and with funding from the former Alberta Family Life and Substance Abuse Foundation. It surveyed young Albertans and their partners to identify family and other factors that relate to substance abuse among teenagers. This study was unique in its large sample size and unique in that it had both teenagers and their parents involved.

5. A new communications procedure being developed at the U of C could give rural and remote communities around the world instant access to advanced medical services and expertise usually only found in large cities.

   Professor Raj Rangayyan of the Department of Electrical and Computer Engineering and radiologist Leo Desautels have been developing a system that could transmit medical images such as X-rays from isolated health-care centres to more advanced urban facilities. Expert medical diagnoses may then be transmitted back to the remote areas via phone or facsimile. The technology, "high-resolution digital teleradiology" could avoid the delays when medical images are sent by postal or courier services. It could also reduce rates of sickness, death and the cost of transportation of patients to advanced health-care facilities.

6. A group of researchers has developed a digital device that can diagnose sleep apnea at a low cost. The new device, SNORESAT, combines digital snore recordings and constant monitoring of blood oxygen levels to determine how frequently patients stop breathing and whether they have sleep apnea.

   Repeated pauses in breathing broken by snores is a common sign of sleep apnea, a disorder affecting about one in four middle-age men and one in 10 middle-aged women, leaving them exhausted and accident prone. Although this sleepiness is easy to spot, a positive diagnosis is difficult and must be made in a sleep laboratory. The Alberta Lung Association Sleep Centre at Foothills Hospital can handle only about 600 patients per year and there is a six-to-12 month backlog of patients waiting to be diagnosed.

SNORESAT can potentially be used at home without the aid of a technician. In an initial series of tests, SNORESAT correctly diagnosed sleep apnea in 96 per cent of cases in a sample of 129 patients. While it is not yet available for commercial use, a second round of testing at patients' homes has been funded. If home testing is successful, SNORESAT may be marketable within a few years.

9.1.4 1995-96 to 1997-98: Strategic Planning

A study and stakeholder discussions leading to the development of a policy framework for university research has been launched. The policy framework will assist the department and the universities in analyzing and taking account of the research function (as distinct or complementary to the teaching function) especially as it may relate to new and important departmental initiatives such as the implementation of accountability measures and a new funding system. This project marks the beginning of formal recognition for university research in terms of this departments' policies. It also marks the beginning of a new set of working relationships between departmental and university staff.

As the outcomes of the project are not yet known, we are not yet able to report on specific long-term strategic directions for university research. We are able to report, however, on the grant levels for Alberta's residential universities for the years between 1995-1998. Table 9.1 represents operating and capital renewal grants from fiscal year 1993-94 (included to show a comparison) to fiscal year 1997-98. These figures are consistent with the business plan and show a decrease of over 19% from fiscal year 1993-94 to fiscal year 1997-98.

Table 9.1 Operating and Capital Renewal Grants to the Residential Universities ($'000's)

UNIVERSITIES	*1993-94*	*1994-95*	*1995-96*	*1996-97*	*1997-98*
University of Alberta	269,973	240,468	223,635	216,926	216,926
University of Calgary	169,414	151,583	140,972	136,743	136,743
University of Lethbridge	36,115	32,143	29,893	28,996	28,996

9.2 Alberta Agriculture, Food and Rural Development

9.2.1 Executive Summary

The agriculture and food industry is one of Alberta's economic opportunities and strengths. The industry has significant potential for growth. Advances in research and technology play key roles in sustaining the industry's productivity and competitiveness.

The annual market receipt for farm output is currently estimated at over $4 billion. Alberta also has a significant processed products sector. It consists of food, animal feed and beverage manufacturing. The value of the sector's annual shipment is estimated at $5.0 billion.

Alberta's annual earnings from out-of-country exports of primary and processed food products exceeds $3 billion. The value of its annual sales to other parts of Canada is about $1.5 billion. The province's agriculture and food industry has received national and international renown for the high quality of its products. The potential for future market gains is considerable.

Past research results have enabled the province to build one of the most productive agriculture and food industries in the world. Continued advances in research and technology are necessary to ensure that the industry retains existing markets, penetrates new markets and sustains opportunities for growth.

Over the next three years (1995/96 - 1997/98), Alberta Agriculture, Food and Rural Development will continue to implement the following strategic direction as part of its business plan:

1. cooperation with industry, conduct research targeted areas to generate relevant leading-edge information and technology.

2. Collect, collate, evaluate and adapt to Alberta conditions new research results and technology from around the world.

3. Encourage greater private sector involvement in funding and conducting research.

The following represent program areas of major concentrations in the department's research effort:

- crops,
- livestock,
- processing,
- engineering,
- economics and marketing, and
- land and water

The scientific results obtained from research will be used to meet both industry needs and the department's regulatory requirements.

The department's total research budget will be reduced from about $18.96 million in 94/95 to $18.22 million in 97/98. Expenditures will be targeted on areas of high potential benefits.

9.2.2 Foundation

The Place of Agriculture and Food in the Alberta Economy

Building on Alberta's economic opportunities and strengths is one of the key economic strategies enunciated in **Seizing Opportunity**: Alberta's New Economic Development Strategy. The agriculture and food industry is one of Alberta's economic opportunities and strengths. Its potential for growth is considerable. The industry is Alberta's future, not its past. Research and technical advances focused on opportunities hold the key to that future.

From the high protein wheat, tender lean beef and choice pork to the nutritionally preferred canola oil, Alberta's food products have received international acclaim for outstanding quality. More importantly, the industry's products are essential to the well-being of all Albertans. The secure food supply and wide consumer choice the industry offers contribute to the high quality of life Albertan's enjoy.

The agriculture and food industry is a multi-billion dollar business and growing. It has two major components: the primary products sector and the processed products sector, with growing biotechnology and industrial uses.

Primary Products

Crops and livestock constitute the primary output of the industry. They are produced by over 57,000 operating units. The total farm market receipt for crops and livestock was estimated at $4.3 billion in 1993.

The province's agricultural land base is about 51.4 million acres. The capital invested in agriculture (in machinery, implements, livestock, land and buildings) exceeds $30 billion. It is in Alberta's best interest to ensure that the land, labor and capital invested in agriculture remain productive, efficient and profitable. Advances in research and technology play vital roles in optimizing the returns from that investment.

Processed Products

The output of the agri-food processing sector represents the processed products segment of the industry. This industry sector, which consists of the food, animal feed and beverage manufacturing firms, is Alberta's largest manufacturing sector. The total value of its annual shipments is estimated at around $5.0 billion.

About 450 companies are involved in the agri-food processing sector. They employ over 16,000 people or 17% of Alberta's manufacturing work force.

Exports

Alberta is a net exporter of primary food products. In 1992, Alberta earned $2.2 billion from out-of-country exports of primary products. That amount represented about 51% of the annual value of primary output. The value of out-of-country exports of processed products for the same year amounted to $840 million or 17% of the value of processed products. The foreign exchange earnings derived from these exports contribute significantly to Canada's merchandise trade balance and Alberta's ability to generate wealth.

Alberta is also a significant shipper of primary and processed products to other parts of Canada. In 1992, the value of shipments of primary products to other parts of Canada was $321 million. However, the value of processed products shipped to other provinces in the same year was approximately $1.2 billion or 3.7 times the value of primary products shipped to other provinces.

Research and technical advances help the industry to remain competitive in national and international markets. Either by improving product quality, reducing unit costs through efficiency, or creating novel products, research results can enable the industry to retain existing markets, penetrate new markets, increase global market shares or sustain opportunities for growth.

Source of Nutrition and Wealth

The agriculture and food industry supplies Albertans and its global customers with a steady supply of high quality, nutritious food products. It provides employment for thousands of Albertans. It brings export earnings into the country and generates wealth. It broadens the provincial and local tax bases and enhances the living standards and quality of life for Albertans.

Industry Research Needs

The agriculture and food industry has considerable potential for growth. To realize that potential, the industry must meet the Canadian and international market needs.

New scientific information and improved technology are needed to:

- expand value-added processing of agricultural, food and industrial products,
- pursue new market opportunities,
- develop alternatives for further diversification,
- generate more environmentally friendly practices,
- establish a more competitive crop base,
- expand the livestock sector,
- enhance the efficiency of natural resource use, and
- provide a basis for new businesses not yet conceived.

Presently, there are a number of growth opportunities in crop and livestock production and value-added processing. Key growth areas in crop production include oilseeds, forages, new crops, and horticultural crops. In the livestock sector, potential exists for growth in beef, swine and sheep production. Alternate forms of livestock, such as game animals and bison, also offer opportunities for expansion.

Over the last two decades, Alberta has built a solid value-added processing base which will provide momentum for future development. Current potential for expanding this segment of the industry include projects involving the production of new, high value prepared foods, cereal fractions, food ingredients and animal by-products.

In addition to the domestic market, Alberta producers and processors have access to foreign markets. The Western U.S., Japan, Mexico, China, South Korea, and Taiwan are growing markets for a range of Alberta food products.

Research is a cornerstone that improves the industry's competitiveness, sustainability and growth. Without research and innovation, industry productivity soon plateaus and quickly slips behind. To take advantage of market opportunities the industry needs to have access to leading-edge technology adapted to Alberta's unique climate and soil conditions. It is, therefore, important to increase the overall level of agriculture and food research in the province.

Past advances in research and technology were the engines that helped the industry to develop rapidly. Indeed, agricultural production would not have been possible in this part of the globe - with its short growing season, harsh winters and unique resource base - if research and technology had not come to the rescue.

The effective application of research results has led to substantial improvements in agricultural productivity and food processing. Successfully applied research results include improved crop varieties, improved breeds of livestock, new food processing methods, scientifically proven production techniques and improved management approaches. Continued investment in research and technology is essential if the industry is to keep pace with Alberta's competitors, create jobs and generate wealth.

Government Research Needs

The department recognizes that science, research and technical innovation are critical components of economic growth and diversification. Internal research capability enables the department to serve the industry better. That capability also allows it to meet its own scientific data needs for properly enforcing standards and regulations. The scientific information obtained through research is particularly important for protecting the safety and quality of the food supply and promoting the proper management of the agricultural resource base.

The department's involvement in research, as outlined in the three year business plan, enables it to:

1. promote, support, and conduct targeted research in cooperation with industry, academic institutions and other government agencies,

2. develop advanced diagnostic and analytical capability and establish scientific standards to meet the department's legislative mandate, and

3. up-grade or keep current the scientific expertise and competence of its staff who provide science and technology based services.

As stated in the department business plan, the generation of new information, adaptation and evaluation of technology will require increased industry funding as well as continued commitment by government. Commodity organizations, processors and others in the industry must increase their financial participation in developing and evaluating information and technology. To this effect, the department will continue to strengthen partnerships and alliances with producer and processor organizations, private sector research facilities, academic institutions and other government research agencies.

The department's research function has been strongly supported at various public consultation meetings over the last two years. The department is committed to helping the industry realize its potential.

Mandate

The Constitution of Canada provides both Canada and the provinces with jurisdiction for agriculture. Both Canada and Alberta legislate, regulate and provide programs and services for agriculture.

Alberta Agriculture, Food and Rural Development operates under the Department of Agriculture Act. Its roles and responsibilities are to administer regulations assigned to it, provide programs and services for the agriculture and food industry and support the growth and development of the industry.

Since its inception, the department has supported the growth and development of the agriculture and food industry. Its roles and responsibilities have changed as it has responded to the industry's changing needs. In the early decades of the twentieth century, the Ministry focused on helping farmers improve their production. In recent years, the Ministry has assisted the industry through research and technology transfer. Support has also been provided in developing new markets and in managing marketing, production, and financial risk and uncertainty. In the 1990s, the Ministry has increased efforts to provide farmers with information on environmentally sustainable practices.

Mission

Alberta Agriculture, Food and Rural Development's mission is to:

> **Ensure the existence of policies and services which support the sustainable growth and development of a market-driven agriculture and food industry.**

Goals

The department has established 8 goals in its business plan to more effectively pursue it's broader mission. Research is a key function of the department. Many of the goals have components that relate to research and technology transfer. Goal #3, which is stated below, however, largely relates to research. Hence, the department's principal research goal is:

> **To develop information and technology that improves industry competitiveness.**

Another closely related goal (Goal #4), which primarily refers to the technology transfer function of the department, is:

> **To ensure the industry has access to needed technology, knowledge, and skills.**

In cooperation with industry and other partners, the department will conduct, fund or facilitate research of particular benefit to Alberta producers and processors. It will transfer the results of its own research as well as those obtained from other sources to industry.

These goals are intended to serve as long-term guides. Division research managers are expected to set the more specific divisional research goals which are consistent with the overall departmental goal. Measurable outcomes have been specified for each goal.

Key Results Expected

The following key results are expected from the department's research effort:

- New scientific information useful for improving agricultural production and value-added processing.
- Leading-edge technology adapted to Alberta conditions that will enable improved, sustainable competitive advantages.
- Increased private sector investment in research.

Strengthened networks, alliances and partnerships.

Three Year Strategic Direction

- Conduct research in production, processing and marketing, in cooperation with others where possible, to generate relevant leading-edge information and technology.
- Collect, collate, evaluate and adapt to Alberta condition new research results and technology from around the world.
- Encourage greater private sector involvement in funding and conducting research.

Ten Year Strategic Direction

The key strategic directions of the department over the next ten years will likely be similar to those shown in the three year plan listed above. Necessary adjustments will be made in subsequent year's business plans. The overall long-term strategy may be summarized as follows:

1. Continued involvement in targeted research in areas with greatest potential benefits.

2. Evaluation and adaptation of new information and technology from around the world to Alberta conditions.

3. Enhancement of diagnostic and analytical capability to sustain the safety or quality of crops, livestock, food products, soils and water resources in support of regulatory requirements.

4. Strengthening research networks, alliances, partnerships, and joint projects with industry, academic institutions, other government agencies, and national and international organizations.

Actions

Specific actions to implement the strategies over the next three years are as follows:

New Information and Technology

1. Encourage and conduct research targeted on those areas with greatest potential for sustainable growth or significant improvement in efficiency.

2. Complete the integration of research/technology transfer programs between the Alberta Tree Nursery and Horticultural Centre and the Alberta Special Crops and Horticultural Research Centre.

3. Continue the Alberta Farm Machinery Research Centre's emphasis on evaluation of concepts rather than equipment makes and models.

4. Develop a stronger applied research program for special crops in central and northern Alberta.

5. Develop disease surveillance and detection capability for crops and livestock in the public and private sectors.

Partnerships and Alliances

1. Strengthen partnerships with private and public research organizations to ensure key research capabilities are maintained.

2. Further develop networks, multidisciplinary teams and joint research with private and public provincial, national and international organizations to ensure that appropriate research is done and duplication is avoided.

3. Promote department research capabilities to the private sector to increase awareness and opportunities for partnership.

Private Sector Research

1. Continue to encourage the development of private sector laboratory capability and research expertise.

2. Continue to encourage the private sector to assume greater responsibility for research important to their respective interests.

The department is one of many organizations involved in agri-food research. It cooperates with universities, agricultural colleges, the federal research stations, producer and processor organizations and private sector research firms in performing its research function.

Although applied and adaptive research will be emphasized, the department may be involved in basic and developmental research if they are necessary to meet the department's research goals. The department also challenges its staff to carry out original and innovative research that has the potential to create novel products or revolutionary solutions to problems faced by producers, processors and agri-businesses.

Technology Transfer

New scientific information and technology developed through research must be effectively transferred to producers, processors and agri-business if the benefits of research are to be realized by society. It is, therefore, necessary to have a strong link between research and technology transfer.

Alberta Agriculture, Food and Rural Development has traditionally placed a special emphasis on transferring the results of research to its clients. Technology transfer to primary producers is conducted mainly through the department's offices located across the province. Specialists working in these offices assist producers and processors with their problems. Professional staff working out of Edmonton and those located in the various research facilities are also involved in transferring technology.

The department uses several approaches in disseminating technical information to producers, processors and agri-businesses. These approaches include publications, demonstration projects, home study courses, direct client contacts, meetings, conferences, radio and television broadcasts and a computer bulletin board system. The department also cooperates with other public and private sector organizations in carrying out technology transfer.

The responsibility for releasing to industry the research results generated in each work unit rests with the unit. Originators of new information have shared responsibilities with specialists working in the field to transfer the information to users and obtaining feedback from clients on problems and areas that require further research. Past experience suggests that department staff have been successful in meeting these challenges. The present research strategy is intended to build on current strength and enhance both the research and technology transfer functions of the department.

9.2.3 Programs and Services

The department's research programs and services are aimed at solving industry problems or developing innovative technology that can be applied by the agri-food industry. The diverse nature of the agri-food industry and the varied environmental conditions under which they operate require broad-ranging research to meet industry needs. The department's research programs cover the following areas:

- Crop Development,
- Livestock Development,
- Processing Development,
- Engineering,

- Economics and Marketing , and
- Land and Water Resources.

Crops and livestock are the marketable products of the farm sector. The research and other services provided in support of these commodities are reflected in the efficiency and productivity of producers, the quality and safety of their products, their global competitiveness and profitability.

The processing sector transforms raw agricultural output into finished products that have added value. Research results help the industry to develop new products, increase efficiency and productivity, enhance quality and safety, foster competitiveness and improve profitability.

The department's research programs have different names for functional and structural reasons. However, their purpose is closely linked. They are all aimed at making the agriculture and food industry technologically advanced, globally competitive, financially profitable and environmentally sustainable. Brief descriptions of each area, accomplishments and planned projects are outlined below.

Crop Development

Crop production is a sizable industry in Alberta. Over 30 different crops, ranging from barley to beans and peas to potatoes are grown. The list is growing as more new crops come off the research plots. The total market cash receipts for crops in 1993 was estimated at $1.4 billion.

Most of the crop development related research in the department is conducted by the Plant Industry Division. This division performs "applied and developmental" research aimed at developing new information and technology that improves the competitiveness and profitability of crop production in the province. The work involved ranges from conducting targeted research to generate needed information and technology to adapting existing information and technology from around the world to Alberta conditions.

Other units of the department, including Economic Services, Marketing Services, Rural Development, Regional Advisory Services, and Irrigation and Resource Management also conduct research or provide services that contribute to the efficiency and profitability of the crop sector. The research work directed to crops covers crop production, processing and marketing aspects.

Crop research results in new information, new varieties, new crop species and new technology that improves the efficiency of crop production. The improvements can be either in yield, in quality, or economic returns. Research and technical advances help the province's crop sector to remain globally competitive and financially profitable.

Developing information and technology that improves the competitiveness of the agriculture and food industry is one of the goals of the department. Information and technology developed through crop related research improves the competitiveness and profitability of the crops sector.

Crop research also generates information useful for conducting crop related regulatory functions.

The following results provide a sample of achievements and contributions of crop related research:

1. Significant new information resulted from crop development research in the past year. From developments in new barley varieties to information on new crops like ginseng, research results continue to widen the options available to Alberta producers.

2. The new hulless barley variety developed through the department's research effort is now giving a significant advantage to Alberta's livestock industry. This variety is also creating new interest in

Pacific Asia for its value as human food. As well, because the digestibility of protein in this variety is higher than other sources, the level of nitrogen in livestock waste is reduced. This lessened the environmental impact of livestock wastes on surface and ground waters.

3. Work aimed at further diversification of Alberta's crop base is continuing. Developments of new and improved varieties and crop management systems for horticulture and specialty crops are expanding the choices available to producers. Advances were made in the past year in such areas as nursery crops, vegetables, seed potatoes, greenhouse crops, herbaceous perennials and woody ornamentals.

4. New varieties of winter triticale and emerging new lines of winter wheats are providing the varied agro-climatic regions of the province with more drought hardy, cold tolerant winter cereals for both forage and cereal uses. Maintaining ground cover over late winter and early spring is an important soil conservation strategy. Thus the increased use of winter cereals has both environmental and economic advantages.

5. New weed and pest management strategies were introduced to reduce crop losses and lessen the environmental impact of weed and pest management practices. Developments in biological methods for control of pests in field crops and greenhouses have a special role in this regard. The control of several weed species in pastures and annual crops plus the development of systems that use bio-control to manage thrips in greenhouses are among the initial successes in this rapidly changing area.

6. Research has revealed that micronutrient deficiency is a major cause of low crop yields, particularly for spring wheat, barley and oats. Several million acres exhibiting micronutrient deficiencies, mainly copper, have been identified in the province. Complex interactions in terms of crop stress, disease, herbicide and fertilizer response are being assessed. Diagnostic methods for confirming the cause of the problem are also being assessed. The economic loss to Alberta producers from micronutrient deficiency is estimated to be in the tens of millions of dollars.

7. Techniques to improve the agricultural productivity of solonetzic, luvisolic, organic and acid soils in Alberta have been released and continue to be promoted. The application of these techniques will substantially improve the productivity of these problem soils.

8. Environmental and resource impact of commercial agricultural practices continue to be assessed. Approaches to enhance the agricultural resource base are pursued as integral parts of research activities focused on production efficiency and competitiveness.

9. Research in other program areas, such as economics and marketing, engineering, land and water resources also contribute to the development and profitability of the crop sector. The results of these programs are listed under their separate headings.

Crop Development Research Strategy, 1995/96 - 97/98

In the next three years, the department will implement the following strategy to foster the sustainable growth and profitability of the crop sector.

Research capabilities and capacity will be sustained. Existing information and technology will be collected, evaluated and adapted to Alberta conditions. Targeted research will be conducted to generate needed information and technology that improve the competitiveness and profitability of crop production in Alberta. Private sector research capability will be encouraged. Networking, partnerships and alliances will be strengthened.

More specifically, research and information development in forages will be increased to improve feed quality, reduce per unit production costs and promote exports. Attention will be given to increasing the competitiveness of horticulture, apiculture, and special crops growers. Integrated agronomic information that allows economic and environmentally sound crop management decisions will be provided.

Livestock Development

Livestock production is a leading component of Alberta's agricultural sector. Market receipts for livestock sales amounted to approximately $2.9 billion in 1993. Research and technology have made substantial contributions to the improvement of livestock productivity.

The department's livestock research programs are directed to animal agriculture. The Animal Industry Division has the primary responsibility for livestock research. However, other units, such as Plant Industry, Rural Development, Economic Services, Regional Advisory Services, etc., also provide research and other services that contribute to the improvement of the livestock production sector.

When conducting livestock related research, department staff use the animals and facilities of cooperating livestock producers or organizations. The department cooperates/collaborates with a number of public and private sector organizations to meet its livestock related research goal. The research programs are focused on activities that maintain or enhance competitiveness and profitability of the livestock sector. Livestock related research projects include animal nutrition studies, animal health and productivity, animal breeding and management, and work relating to the diversification of the livestock industry (bison, elk, llamas, alpacas, etc.).

Research results help increase output per animal, improve product safety and quality, reduce unit production costs or improve economic returns. Past research has contributed immensely to the productivity, efficiency and competitiveness of the province's livestock industry.

The beef cattle sector provides an example of the competitiveness of the livestock industry. From modest beginnings about a century ago, Alberta is now the largest beef cattle producing province in Canada. It accounts for 63% of Canada's total fed cattle production. It is the fifth largest beef cattle producing jurisdiction in North America.

Alberta's beef cattle industry at present is a market-driven, globally competitive sector. Its competitiveness is underlined by the fact that about 42% of all beef calves born in Alberta are exported primarily to the U.S. In 1993, the value of Alberta beef exports totaled $292.6 million. The U.S. accounted for almost 93% of the export. Expanding markets for livestock and livestock products can be expected to create continued growth and expansion of the livestock industry. Research and technical advances can make important contributions to that growth.

Developing information and technology that improves industry competitiveness, in cooperation with partners, is one of the goals of the department. The department's livestock research effort contributes to that goal. Livestock research also generates new information regarding animal health, disease prevention, surveillance, detection and treatment for use within the department. The information generated helps the department to properly carry out its regulatory duties. The information allows it to maintain animal health standards designed to protect the safety and quality of the food supply.

The recent accomplishments and contributions of the department's livestock related research are:

1. New methods of minimizing production costs in beef and sheep, suggesting alternative management strategies, and increasing production efficiency.

2. Optimizing reproductive efficiency and minimizing calving difficulty by altering animal management practices.

3. New management practices that improve animal welfare.

4. Continued research in animal nutrition, pasture production, health and reproduction of beef and dairy cattle, sheep, swine, poultry, horses and elk.

5. Analytical services to evaluate feeds, identify deficiencies and make recommendations to improve the nutritional quality of rations.

6. Diagnostic services provided with useful information for disease prevention, disease monitoring, quality control (immunology and serology) services to standardize performance in private laboratories and development of culture media to enhance mastitis control on dairy farms.

Livestock Development Research Strategy, 1995/96 -1997/98

In keeping with the department's strategy, the livestock related research effort will be directed at evaluating and adapting existing information to Alberta conditions, generating new information in targeted areas and strengthening networking, partnerships, and alliances with other public and private sector organizations.

Some of the more specific strategies are:

1. Sustain research and analytical capabilities.

2. Produce new animal health information in support of surveillance and disease detection.

3. Develop new information that improves pork industry competitiveness.

4. Generate new information that will improve reproductive efficiency, feedlot performance of livestock and reduce production costs.

Processing Development

The agri-food processing sector is an important and growing sector. An estimated 450 companies process and add value to Alberta's primary agricultural products. Their annual revenue is estimated at around $5.0 billion. Research and new technology are important to the continued profitability and sustained growth of the sector.

Food processing research and technology transfer are conducted at the Food Processing Development Centre (FPDC) located in Leduc. FPDC is primarily a technology transfer facility designed to strengthen and expand the capability of Alberta's food processors to meet the challenges of the marketplace. Food processors can, through the application of new technology or research results, develop new or improved products and processes.

Alberta Agriculture, Food and Rural Development has a food laboratory located in Edmonton. The laboratory's mandate is to provide analytical, scientific and technical services to the agriculture and food industry to ensure that the safety and quality of the food supply is maintained and enhanced.

Processing research results help improve the competitiveness and profitability of the agri-food processing sector by improving existing processes and products, developing new processes or products, improving the quality and consumer acceptance of products and improving packaging.

The generation of new information and technology that improves competitiveness, profitability and sustained growth of the processing industry is closely aligned with the department's goal of expanding value-added processing. The analytical and research capability maintained in the food laboratory play an important role in meeting the department's mandate of ensuring the safety and quality of the food supply.

The following represent some of the recent accomplishments and contributions of the department's food processing related research and technical services.

1. Fibrinogen, a protein extruded from an animal by-product was developed as a bonding agent in meat processing. This process has led to the establishment of F.N.A. Foods Inc. in Alberta. The company began construction of a $2.5 million plant in Strathmore in August, 1994 to produce Fibrimex, a commercial product based on the Fibrinogen work done at the Food Processing Development Centre.

2. An initiative to replace imported soybean meal with Alberta grown peas, hulless barley and canola meal for animal feed rations was supported.

3. A value-added processed potato product containing meat was developed for test market evaluation in Japan.

4. Extrusion processing was developed and utilized to pre-cook peas and beans for use as ingredients in processed foods.

5. New products were developed with a longer shelf-life and environmentally friendly packaging to increase marketability.

6. Regulatory, research and extension efforts helped improve milk quality in the province.

7. The quality and safety of the food supply is maintained and enhanced as a result of continued monitoring, research and laboratory analysis.

Processing Development Research Strategy, 1995/96 - 1997/98

In cooperation with industry, university, and federal research stations the department will develop, compile and provide information and technical services to promote the global competitiveness of the processing industry.

Areas of involvement may include the generation of new information, new product development, new food packaging techniques, assessment of new technologies for shelf-life extension of food products and food quality and safety improvement.

The areas listed below carry out research and technical services that support crop and livestock production as well as the agri-food processing components of the industry.

Engineering

Engineering related research applicable to the agriculture and food industry is conducted by the Engineering Services Branch of the department in cooperation with other units. The Alberta Farm Machinery Research Centre (AFMRC) in Lethbridge and the Alberta Renewable Energy Test Site (ARETS) in Pincher Creek are part of this branch. AFMRC has the capability of testing and evaluating farm machinery. It also conducts research into the efficiency of farm machinery as well as safety and

performance standards. ARETS assists manufacturers in the development, testing and demonstration of renewable energy systems used for agricultural purposes.

Other applied research projects are conducted by agricultural engineering to increase the efficiency and profitability of crop and livestock producers and agricultural processors. This is done through the use of appropriate systems, equipment, machines, structures and buildings. Specific areas of research include grain harvesting, energy efficiency, global positioning systems (GPS), agricultural management practices, production and processing systems, waste management and farm water supply.

Recent accomplishments and contributions:

1. Engineering solutions to crop production and processing systems including seeding, spraying, tillage, and harvesting, crop conditioning, crop handling and storage, and seed cleaning.

2. Systems for the processing of food and industrial products including honey, wild rice, saskatoon berries and flax fibre.

3. Departmental engineering expertise was used for designing intensive livestock housing and feeding, manure management and odor control systems to improve efficiency, address environmental issues and increase profitability.

4. Engineering solutions to ensure safe and adequate farm water supply, including dugout design, water treatment, pumping water using solar and wind power, snow trapping and improved water distribution and use.

Engineering Research Strategy, 1995/96 - 1997/98

1. Conduct and participate in research to generate new information and evaluate new technology, processes and systems for production and processing enterprises.

2. Strengthen capability to support the industry's ability to diversify and add value to the commodities it produces.

3. Strengthen and expand networks to conduct more joint research projects with other agencies and industry.

4. Evaluate information and technology for adaptation to specific opportunities and areas in the province.

Economics and Marketing

The Economic Services Division and the Marketing Services Division are involved in economic and marketing research. They cooperate with other divisions of the department, private sector organizations, universities and other government agencies.

The topics studied include economic, marketing, financial, taxation research issues relating to crops, livestock and processed products. Economics and marketing studies permeate all agricultural activities ranging from new land and irrigation development to the production and processing of crops and livestock. Information is also produced in commodity marketing, costs, returns and profitability of farm enterprises and farm business management.

The department also conducts or arranges for research in the analysis and identification of specific market opportunities in Canada and abroad. Studies relating to niche market access strategies and market

analyses for specific commodities are conducted with the aim of providing better market information to industry. Opportunities for innovative marketing of primary and processed products are pursued.

Recent accomplishments and contributions:

1. Useful information was made available to producers on production economics, farm finance and agricultural policy.

2. Analysis pertaining to supply and demand of agricultural commodities and products, market trends, global competitiveness, trade policy, and buyer/consumer preferences were conducted.

3. The international marketing services of Alberta Agriculture, Food and Rural Development focused on higher value food, beverage and feed products.

4. Research results enabled farmers to determine how well they are performing relative to other producers and are encouraged to make the necessary changes to reduce input costs and/or increase output from existing farm resources.

Economics and Marketing Research Strategy, 1995/96 - 1997/98

1. Encourage research targeted at those areas with the greatest potential for growth or significant improvement in efficiencies.
2. Expand economics and marketing information relating to production and value-added processing.

3. Develop/strengthen networks and joint projects with private, public, national and international organizations.

Land and Water Resources

The Irrigation and Resource Management Division conducts research related to irrigation, drainage, soil conservation and water quality. It cooperates with universities, Agriculture and Agri-Food Canada, applied research associations, other departments and other divisions in Agriculture, Food and Rural Development.

Studies pertaining to irrigation as well as land and water are focused on promoting the stewardship of agricultural land and water resources. Alberta farmers and food processors market products with a market advantage that they are produced in a natural, pristine environment. Sustaining the productive capability of these resources minimizing environmental impacts is essential for the agriculture industry.

Research efforts are aimed at the protection of surface water and ground water quality, soil quality, soil moisture management, land evaluation, seepage control and land reclamation and efficient irrigation and drainage management technology. Efforts are also directed at the development of information and technology for dryland soil and water conservation and integrated farm conservation planning.

Recent accomplishments and contributions:

1. Surface and groundwater studies at the plot, field and watershed scale have been initiated to determine if agriculture in Alberta has an impact on water quality.

2. An on-farm water management study was conducted to evaluate an alternative to uncontrolled drainage and evaluate management options that mitigate loss of wildlife habitat.

3. Sustainable cropping studies to evaluate crop rotations for their effects on soil quality, yields and economic returns.

4. Soil and water quality monitoring continued at several bench mark sites across the province. This included the development prediction models and their associated databases.

5. Evaluation of the beneficial impact of field shelterbelts on soil moisture and crop yields is being continued.

6. Salinity mapping and identification of control methods at the municipal level are proceeding.

7. Use of semi-automatic surface irrigation and low energy precision irrigation application systems.

8. Biological control of aquatic vegetation in irrigation canals and farm dugouts using grass carp fish is being assessed.

9. Studies to trace the migration of nitrates in groundwater were continued.

10. Studies were conducted to improve water use efficiencies and reduce return flows in irrigation districts.

11. Irrigation management practices were evaluated to determine the best irrigation schedules for maximum crop production.

12. Standards used to determine suitability of specific land and water for sustained irrigated production were assessed.

Land and Water Resources Research Strategy, 1995/96 - 1997/98

1. Target and conduct research to clarify what effect, if any, current agricultural practices have on surface water and ground water quality in Alberta.

2. Work with Agriculture and Agri-Food Canada to develop reliable agro-environmental indicators.

3. Evaluate technologies and management practices that protect soil, water and wildlife resources while enhancing agricultural profitability.

4. Provide fundamental soil, water and climate data bases to other researchers in the evaluation and development of new technologies, management practices and expert knowledge systems.

5. Refine irrigation water use requirements for application in future water allocation decisions.

6. Maintain advanced capability and specialized knowledge needed to carry out the department's legislated mandate.

7. Develop and improve partnerships and alliances with industry and researchers to promote, coordinate, fund and collect results of agriculture and food research.

Benefits of Agriculture and Food Research

Research is designated as a core function of the department because it meets both government and industry needs. There are benefits associated with meeting these needs.

Meeting Industry Needs

The results of research conducted by the department benefit the industry by improving productivity, efficiency, competitiveness and profitability. The benefits can be either through increasing revenue or reducing costs.

The total market revenue for crops and livestock in 1993 was estimated at $4.3 billion. If research results would lead to an overall revenue improvement of 1%, the total benefit to industry would amount to approximately $43 million. Alternatively, a cost reduction of 1% for the same year would have saved the industry $40 million.

The potential returns to investment in agriculture and food research are exceptionally high. A study conducted in Ontario showed a $40 return to $1 invested in agricultural research and supporting services. The study considered funds invested by federal and provincial agencies and the private sector in crops and livestock research.

A more limited evaluation of 10 research and 10 demonstration projects funded by the Alberta Agricultural Research Institute showed a $60 return to $1 invested in the projects assessed.

Specific assessments involving the department's research effort have also been made. For example, the benefits from barley breeding and related crop research work conducted by the department at Lacombe was estimated at approximately $94 million per year. The breeding program was conducted over a 20 year period and the cumulative cost is estimated at approximately $20 million.

Benefits of research to the livestock sector have also been equally impressive. For example, one recently completed department study involving the spaying of heifers showed a potential gain to cattle producers, feedlot operators and meat packing plants of $750,000 if the newer method of spaying was used.

New products, new packaging techniques and process improvements have increased efficiency in the value-added sector. It is important to continue research efforts in this area because the potential rewards are very high. For example, if a 1% industry wide increase in revenue is achieved as a result of employing more efficient technology, the annual gain to industry could be as much as $50 million.

Research and development results may also encourage new investment in the value-added sector. For example, it was recently reported that the results of a test conducted by the department's Food Processing Development Centre at Leduc has convinced a European company to build a plant in Alberta. The plant will produce a meat-binding product for international markets.

Meeting the Government's Regulatory Mandate

The primary reason for government involvement in research and technology transfer is to stimulate economic growth, increase employment and create wealth. Economic expansion and job creation in turn lead to increased tax revenues. From the agriculture and food industry's point of view, the results of government investment in research have been extremely rewarding for both the province and the industry.

Equally important is the need to set scientific standards for product quality and safety. Supporting research and maintaining expertise in relevant scientific fields has enabled the government to properly carry out its regulatory functions. Hence, the government derives significant benefits from the research programs and scientific activities conducted in the department's laboratories. The work conducted in these laboratories continues to protect the safety and quality of the province's food supply.

9.2.4 Measurable Results

The department has established measurable results for its goals. The measurable results for goal # 3, which focuses on research is as follows:

1. Increase in research and information development in areas of greatest potential for economic return and sustainability.

2. Increase in the number of marketable products resulting from new leading-edge technologies that lower cost, improve quality or generate a new product.

3. Increase in private sector investment in research.

4. Continued positive return from research investment.

Closely tied to the research results are the results used to measure the effectiveness of technology transfer. The measurable results identified for the technology transfer goal are:

1. Increase in adoption of new technologies, knowledge and skills that address industry opportunities, solve problems and improve profitability.

2. Increase in market share as a result of improved competitiveness.

3. Number of knowledge and skill training opportunities offered by both private and public sector educators.

Evaluation Process

Evaluation of research programs in the department is conducted at three levels. The first level involves the **relevance** of the program to industry or government needs. If the program is intended to meet industry needs, on-going consultations are conducted with industry representatives to ascertain the relevance and priority of the research program.

If the program's primary purpose is to meet government regulatory requirements, the unit manager and the researcher involved determine the review process required. The individuals responsible for enforcing the regulation and both internal and external peers might be involved in determining relevance.

The second level of review relates to the **scientific merit, and research design**. The unit manager, the researcher, as well as internal and external peer reviews may be involved at this stage. Such reviews are done to ensure that some vital scientific component or design criteria have not been overlooked.

The third and final level involves evaluating the impact or benefit of the results to industry. This is done after the research has been completed and time has been allowed for the practical application of the results.

The current practice is to conduct industry impact or economic benefit evaluations at appropriate time intervals. The evaluation may be done by external consultants, outside advisory committees or ad hoc committees specifically created to carry out the needed program evaluations. As well, program managers regularly evaluate the research functions of staff, and often in considerable detail during annual budget reviews and as part of the annual staff performance appraisal.

Research Coordination

There is effective coordination of research internally and with external organizations. Internally, the department has established product/commodity teams and goal teams. The members were drawn from various units of the department. These teams regularly review activities, exchange information and ensure that the department's research and other goals are being effectively pursued.

Department researchers and officials are also in constant contact with researchers in federal, provincial, academic and private sector organizations, and attend various provincial and national committee meetings. Special consultative bilateral meetings are also held with relevant organizations, such as the Research Branch of Agriculture and Agri-Food Canada, the University of Alberta, producer commissions and private sector research firms. These meetings are used to exchange information on programs, discuss joint projects and promote greater coordination of research.

The Alberta Agricultural Research Institute also plays an important role in the coordination of agriculture and food research in the province. Through its extensive Board of Directors and committee structure, which involves key individuals from the private sector, academic institutions and government agencies, ARI fosters effective coordination of agri-food research in the province. The commodity by commodity review of research in which representatives from industry, academic institutions, private sector research firms and government research centres participate under the sponsorship of ARI has also proven to be effective in promoting research coordination.

9.2.5 Human Resources

Alberta Agriculture, Food and Rural Development fully recognizes that the achievement of its goals rests on the competence and commitment of department employees. The department recognizes that employees are the essential resource for accomplishing its goals.

The department's decentralized approach to research management ensures that research is conducted close to the point at which technology is delivered to users. This has three distinct advantages:

1. It helps to generate new information that is more applicable to specific areas and would be rapidly transferred to industry.

2. It helps in developing the skills and knowledge of staff in the various sections and keeps staff current with respect to advances in scientific knowledge.

3. It provides opportunity to users to bring unresolved problems to the attention of researchers more rapidly.

Over the past decade, Alberta Agriculture, Food and Rural Development has developed a strong complement of staff who perform research, manage research grants and transfer technology to the agri-food sector. It has qualified staff who carry out research in the program areas specified. The department's full-time equivalent positions devoted to research and related scientific activities are estimated at 85 professional and 159 technical person years.

It has been the department's long-term policy to involve staff in research as a way of developing and keeping their scientific and technical skills up-to-date. Accordingly, a significant number of department staff devote part of their time to research.

Staff who perform research functions need adequate skills in scientific and technical disciplines relating to agriculture and food. In addition, they are expected to have corporate competencies.

These competencies include:

Leadership for Change
Effective Communication
Quality Service
Business Focus
Big Picture Focus
Teamwork

The department is committed to:

1. The selection and development of compatible and capable individuals. It will also provide opportunities for training, retraining, exchanges, secondments, job enrichment, and management development.

2. A systems approach: integration of specialties across functions.

9.2.6 Implementation Plan

This research and technology development plan is based on and directly contributes to the department's business plan. The department business plan is the result of an extensive planning process with industry stakeholders and Ministry staff. It is a shared vision about the future of the industry.

This document consolidates and highlights the department's research function already enunciated in the department's business plan. Accordingly, the research and technology development plan will be implemented as an integral part of the business plan. The following key actions will be implemented.

1. New information and technology will be developed in targeted areas.

2. Networks, partnerships and alliances will be developed with public and private sector organizations.

3. The private sector will be encouraged to increase its participation in and funding of research.

9.2.7 Financial Plan

Three Years - 1995/96 To 1997/98

The estimated provincial investment in 1994-95 for agri-food research and related scientific activities by Alberta Agriculture, Food and Rural Development is over $18.9 million. The annual investment would decline to $18.2 million by 1997/98. The budget for some programs may increase from year to year due to re-allocation of funds from other functions.

Table 9.2.1 provides a detailed breakdown of the anticipated investment.

Longer Term Projections

Longer term research and development budget forecasts are difficult to make at this time. However, significant increases are not being anticipated. However, adjustments in department functions may continue to influence the overall research budget.

The current plan is to increase the volume of research conducted by building partnerships and alliances with private and public sector organizations rather than by increasing government expenditures.

TABLE 9.2.1

BUDGET FORECAST FOR 1994-95, AND ESTIMATES FOR 1995-96, 1996-97 AND 1997-98

Estimated Divisional Research Budget Area	1994-95 Fiscal Year Budget Forecast	1995-96 Fiscal Year Budget Estimate		1996-97 Fiscal Year Budget Estimate	1997-98 Fiscal Year Budget Estimate
		R&D	RSA		
Crops	$6.91	$3.49	3.16	$6.60	$6.60
Livestock	4.33	2.36	2 .13	4.61	4.91
Processing	1.20	0.63	0.57	1.22	1.22
Engineering	1.10	0.54	0.48	1.00	1.00
Economics & Marketing	1.55	0.74	0.67	1.19	1.19
Land & Water	3.88	1.94	1.75	3.31	3.31
Total	$18.96	$9.70	$8.76	$17.93	$18.23

9.3 ALBERTA AGRICULTURAL RESEARCH INSTITUTE

9.3.1 Executive Summary

The agriculture and food industry is one of Alberta's economic strengths. The Alberta Agricultural Research Institute (ARI) is committed to supporting high priority research that will foster growth of the industry and increase its contribution to the provincial economy. Advances in research and technology enable the industry to produce high-quality food for Albertans, compete globally, provide employment and generate wealth.

ARI was established in 1987. Its mission is to coordinate, promote and support research for the benefit of the agriculture and food industry and the Alberta economy. This mission is consistent with and reinforces the Ministry of Agriculture, Food and Rural Development's mission.

The results of research and demonstration projects funded under ARI programs are adding wealth to the Alberta economy. A consultant's study conducted in 1992 estimated a $60 return to $1 invested in the projects evaluated.

Studies conducted in other provinces and other countries have also shown that society gains high returns from investment in agricultural research and development. For example, an evaluation of the costs and benefits of agricultural research and supporting services in Ontario showed a $40 return to $1 invested. Unlike the ARI sponsored project evaluation, the Ontario study involved research funded by provincial, federal and private sector sources. The ARI study considered only projects funded under the Farming for the Future Research and On-Farm Demonstration Programs. The conclusions of both studies, however, are similar. They clearly show that investment in research and innovation yields high returns to society. Such investments are vital for continued wealth creation.

Seizing Opportunity - Alberta's New Economic Development Strategy - identified science and technology as keys to the future economic prosperity. Strong support was also expressed for research during public consultation meetings, such as Toward 2000 and Creating Tomorrow, conducted over the last two years.

In June 1994, a series of agricultural policy consultations were held across the province. The majority of the respondents to questions on proposed strategies agreed that the Ministry should support research in partnership with industry. The key role research plays in creating wealth was emphasized.

ARI is an example of the new approach to government. It is devoted to meeting its goals by facilitating greater coordination and cooperation among agencies conducting agriculture and food research. It also involves the private sector directly in priority setting and research funding. The research projects funded by ARI are conducted at private sector facilities, academic institutions and government laboratories.

ARI has developed a bold, new strategic direction and plans to meet its expenditure target by taking a number of actions. These actions are designed to stimulate overall investment in agriculture and food research while keeping ARI's expenditure within the expenditure target.

Administration costs have been reduced in 1994/95. Committee activities have also been streamlined. Efforts will continue to reduce administrative costs and improve internal efficiency in the years ahead.

Further adjustments will be made in programs. The Research Professorship Program and the Scientific Conference Assistance Program will be discontinued in 1996/97. Funds will continue to be shifted from direct project funding to matching grants to stimulate more private sector contributions for research. Project funding under the National Agricultural Biotechnology Initiative (NABI) will be managed as part of the Matching Grants Program.

Efforts will continue to market ARI programs and research capabilities within the province. The aim is to increase partnerships and alliances with the private sector, the universities, and government agencies in supporting research and transferring the results to users.

9.3.2 Foundation

Introduction

One of Alberta's key economic strategies is building on its strengths. The agriculture and food industry is one of the province's economic strengths. Research and technical innovations are important to maintain that strength.

The agriculture and food industry is a multi-billion dollar business. The total farm market receipt for primary products in 1993 was estimated at $4.3 billion. The agri-food processing sector, which consists of the food, animal feed and beverage manufacturing industry, is Alberta's largest manufacturing sector. The annual value of its shipments is estimated at about $5.0 billion. There is potential to increase the annual value of shipments from the agri-food processing sector to $10 billion in the next 10 to 15 years. As the value-added processing sector expands, the demand for primary farm products can be expected to rise.

ARI is dedicated to supporting the best research that will lead to the development of valuable information and leading-edge technology for the agriculture and food industry. The industry produces a steady supply of high quality, safe and nutritious food. It meets Alberta's needs for most food products - from bakeries to choice meats and dairy products.

In addition, it exports a substantial proportion of its output to markets around the world. By doing so, it creates jobs and wealth. It contributes significantly to employment, income and the high standard of living Albertans enjoy. Continued research and innovation are vital for the future of the industry.

The application of technical innovations increases the industry's ability to remain competitive, profitable and sustainable. The new global economy is based on knowledge and information. Research and innovation are key requirements to participate effectively in the new economy.

Investing in research and technology development is widely supported in Alberta. Such support has been expressed by a broad cross-section of Albertans who participated in the Toward 2000 Together and Creating Tomorrow public consultation processes. Seizing Opportunity: Alberta's New Economic Development Strategy released by Premier Ralph Klein in the spring of 1993, considers investment in new technology and its commercialization essential to keep pace with Alberta's competitors, and to create jobs and generate wealth. The Standing Policy Committee on Agriculture and Rural Development held public consultations in late 1993 to discuss the options for the Ministry's future direction. During those consultations strong support was expressed for increasing resources directed to research.

In June 1994, the Minister of Agriculture, Food and Rural Development held a series of agricultural policy consultation meetings across the province. The majority of the respondents who answered the question relating to the strategy on research supported the proposal that the Ministry, in partnership with industry, should target and conduct research to generate new information and technology. One participant summed the general feeling with these statements, "I think future wealth will depend on today's research. We need to be on the leading edge of technology and be able to distribute that information to farmers in an efficient manner in order to get ahead of our competitors."

ARI is closely aligned with the new approach to government. It serves as a coordinating body for agriculture and food research. It selects and funds targeted research and demonstration projects. It involves members of both the private and public sectors in governing and directing its entire operation. The projects it supports are conducted at private sector research facilities, academic institutions and government research stations.

Knowledge and technology developed through scientific research have played key roles in the development of Alberta's agriculture and food industry. By effectively applying the results of research, agricultural producers and food processors have created some of the most productive enterprises in the world.

Today the industry faces challenges and opportunities in the global marketplace. In 1994, the industry entered a new era in international trade. The new General Agreement on Tariffs and Trade (GATT) and the implementation of the North American Free Trade Agreement (NAFTA) have widened opportunities for market access. However, competition for these markets will also be sharp.

The pioneers of the last century opened up the vast potential of the prairies despite untold hardships. Current and future generations of Albertans face their own challenges as they try to capitalize on the opportunities that global trade offers. Knowledge, technology, and innovation are crucial for "winning" in global competition.

This business plan outlines the actions ARI will take to carry out its mandate over the next three years. It specifies how ARI will use the resources at its disposal to contribute to the building of a competitive, sustainable and market-driven agriculture and food industry.

Mandate

ARI is a provincial Crown corporation. It was created in 1987. It derives its authority from the Agricultural Research Institute Act (1987). The Act specifies the following purposes for ARI. The Institute may:

a. coordinate, conduct, participate in, promote, and support research in agriculture;
b. compile, assess, and disseminate information relating to research in agriculture and information on technology related to agriculture;
c. fund in whole or in part research professorships or chairs established for a purpose consistent with the purposes of the Institute; and
d. assist in providing research equipment and research facilities.

The Act also assigned the following responsibilities to ARI:

It shall, at the request of the Minister, advise the Minister on questions of scientific and technological methods affecting agriculture, and it shall supervise matters related to agriculture assigned to it by the Minister.

Achievements

In a relatively short life of seven years, ARI has made significant progress. It has successfully implemented its mandate and has recorded important accomplishments.

The coordination of research policy and decision making has been strengthened since ARI was established. This was achieved by involving representatives of the key players in agriculture and food research in Alberta (the private sector, academic institutions, and government agencies) on the ARI Board and advisory committees. This integrated structure has led to greater understanding of the challenges and opportunities in agriculture and food research by those directly involved.

As well, the total amount of research grants available to agri-food researchers in the province has increased significantly after ARI was established. ARI was able to accomplish this primarily by creating the Matching Grants Program to encourage greater private sector financial contributions for agriculture and food research.

In addition to funding research, ARI encourages researchers to work more closely together where appropriate. ARI's Research Coordination Program has made it possible for many researchers from different disciplines and organizations to cooperate more effectively and coordinate their activities on common projects.

To date, over 400 leading agriculture and food researchers in western Canada have applied their knowledge, talents, skills and facilities to develop ways of improving Alberta's agriculture and food industry. They have been active participants in projects funded under ARI programs, including Farming for the Future. Involvement in ARI projects has also allowed these researchers to more effectively coordinate their research activities. The final outcomes have been a more improved research result for Alberta and greater coordination and cooperation among the researchers.

The achievements and benefits that can flow from the works such a large number of intellectual talents and scientific minds can indeed by impressive. This has been the case with many ARI projects. Some of the benefits are outlined below.

Benefits

The benefits of research and technology transfer supported by ARI have been substantial. A few examples are outlined below:

Crop Production Technology: ARI has funded research that has led to the development and regional adaptation of new crop varieties. Crop production has also been made cost-effective through yield increases, disease reduction and environmentally responsible input management. Canola research was one of the most heavily funded areas under ARI. The results of that research have already paid dividends as demonstrated from the success of canola in the marketplace. The benefits of the research efforts have become particularly apparent in 1994. This year, canola will emerge as the leading cash crop for the first time in the history of the province. Farm cash receipts from canola are expected to be between $600 and $700 million and may exceed receipts from wheat by at least $100 million. In 1993, provincial farm cash receipts for canola were around $372 million and for wheat about $558 million.

Livestock Production Technology: ARI funded projects have led to advances in animal health, livestock productivity and high product quality. Projects have been supported in the areas of vaccine development, animal nutrition and livestock production. Research in livestock production technology supports an industry with annual farm cash receipts estimated at $2.9 billion.

Agri-Food Processing Technology: New product and packaging technology developments have been supported. Alberta has become a leader in the further development and utilization of an innovative food packaging technology called MAP (Modified Atmosphere Packaging). This technique has resulted in marked improvement in the quality, safety and life of perishable food, particularly meats. It has opened new export market opportunities for Alberta products. Other areas supported include leading-edge research areas such as the extraction of high value-added pharmaceuticals from livestock by-products.

Return on Investment: In 1992, ARI commissioned Serecon Management Consulting Ltd. of Edmonton to evaluate the economic benefits of ten research projects and ten on-farm demonstration projects supported under Farming for the Future. Serecon estimated the return to the provincial economy from these projects, over the next fifteen years, at a staggering $455.6 million (1992 dollars). The total amount allocated by ARI to the projects was $7.24 million. These figures suggest that the investments made in the projects evaluated have returned in excess of $60 to the provincial economy for every dollar invested.

Studies conducted in other provinces and other countries have also shown very high returns to investments in agricultural research. For example, an evaluation of the costs and benefits of agricultural research and supporting services in Ontario showed a $40 return to $1 invested.

Although the results are comparable, the methods used by the ARI sponsored project evaluation and the Ontario study are different. Unlike the ARI sponsored evaluation, the Ontario study assessed the combined costs and benefits of research funded by the provincial and federal governments and private sector organizations. It also assessed returns to both research and technology transfer. The conclusions of both studies, however, clearly underline that investments in agriculture and food research are extremely rewarding for society. Continued investments in technology development and the application of innovation are vital for wealth creation.

The 20 projects evaluated by Serecon represent only 1.33 percent of the 1,500 projects supported under Farming for the Future to the end of March 1992. Yet, the returns from the 20 projects alone dwarf the total cost of $77.3 million committed to the 1,500 projects between 1979 and 1992.

An earlier evaluation of the Farming for the Future Program resulted in a similar impressive return. It was conducted in 1991 by Dr. Travis Manning, Professor Emeritus of Agricultural Economics at the University of Alberta. Manning estimated the benefits of the program to Alberta at $415 million over 25 years. He concluded: "Very few alternative public investments could hope to earn nearly the high rate of return this program enjoys."

Intangible Benefits: Not all benefits of agri-food research can be accurately measured in dollars and cents. Research support enhances coordination and cooperation among researchers in the private sector, universities and government. It helps in training young scientists, thus providing a strong investment in the future of the province. As well, agri-food research advances agricultural knowledge, which remains in the public domain. Research results are used to provide the technology for better stewardship of land and water, thus improving the environment and enhancing the quality of life for all Albertans.

Mission

ARI's mission is to promote, coordinate, prioritize and support agricultural research ensuring transfer of the resulting knowledge for the benefit of a viable and sustainable agri-food industry.

ARI's mission and goals are consistent with the mission and goals of the Ministry of Agriculture, Food and Rural Development.

In keeping with its mandate and mission, ARI has established the following goals. These goals direct and focus its day-to-day operations.

Goals

1. **Marketplace Opportunities and Constraints** - To generate new information that will improve the industry's ability to expand its share of domestic and global markets.

2. **Agriculture and Food Processing Opportunities and Challenges** - To develop new information and technology that will increase the industry's ability to add value to agricultural commodities, create new products and new packaging techniques.

3. **Resource Conservation and Environmental Sustainability Issues** - To generate new information and technology that will improve the stewardship of soil and water resources used in agricultural production.

4. **Agricultural Production Opportunities and Problems** - To develop information and technology that will improve agricultural production efficiency, develop cost-saving technologies, enhance food safety and quality, and promote animal welfare.

5. **Demonstration of New Technology Distribution of Research Results** - To support and encourage activities that promote the transfer and utilization of research results and new technology by producers, processors, and consumers.

9.3.3 Programs

ARI has ten programs that enable it to translate its mandate, mission and goals into action. They are:

1. **Focus on Opportunities Program** - The purpose of this program is to explore opportunities for improving primary and processed products and resource use.

   The Focus on Opportunities Program involves a cyclical series of workshops where research related issues are examined on a commodity by commodity basis. Leading-edge research and future opportunities are also discussed. Participants of the workshop include the ARI Board as well as invited representatives of industry organizations and research agencies.

2. **Research Coordination Program** - The purpose of the Research Coordination Program is to enhance coordination and cooperation among agriculture and food researchers. Successful applicants receive financial assistance primarily to cover the costs of joint planning meetings and data exchanges.

Farming for the Future - Farming for the Future programs are financially supported by the Alberta Heritage Savings Trust Fund. Effective **April 1, 1995**, the research funding portion of Farming for the Future will have two elements: (a) Farming for the Future Direct Funding Program, and (b) Farming for the Future Matching Grants Program. These changes are necessary to more accurately reflect the future direction of ARI. The demonstration funding portion will remain the same.

Under the business plan, a significant portion of Farming for the Future funds are being shifted from direct funding to matching grants. The funds available for direct funding will be aimed at those research areas that meet the eligibility criteria established by the ARI Board. As well, Farming for the Future has established a strong reputation for funding research and demonstration projects. Hence, the new names tie these features together.

3. **Farming for the Future Direct Funding Program** - This program will replace the former Farming for the Future Research Program. The purpose of this program is to provide direct funding for research projects that meet the eligibility criteria established by the ARI Board. The funds will be aimed at research areas of high importance to the industry and the province but are not likely to obtain matching support from the private sector because of their "public good characteristics". Eligibility criteria have been established and are available to potential applicants. Examples of eligible areas include: basic research in agriculture and food, new and emerging commodities and products that offer potential for diversification, stewardship of soil and water.

4. **Farming for the Future Matching Grants Program** - This new name will replace the former Matching Grants Program of ARI. The purpose of the Farming for the Future Matching Grants Program is the same as that of the program it replaces. It is to help build partnerships and alliances, primarily with the private sector, and expand support for research. Under this program, the Institute funds approved research projects on a 50:50 basis with the private sector and other eligible sources. Funds from other Government of Alberta sources are not eligible. In addition to Farming for the Future funds received from the Heritage Fund, the ARI will commit funds from its General Revenue budget and other sources for research support under the Farming for the Future Matching Grants Program.

5. **Farming for the Future On-Farm Demonstration Program** - The On-Farm Demonstration Program is financed under the Alberta Heritage Savings Trust Fund. It

provides financial assistance for projects that demonstrate proven technology to potential users. Under this program farmers or private sector cooperators, staff from Agriculture, Food and Rural Development, and/or researchers work together to demonstrate the application of new technology. Cooperators provide their land, labour, machinery or support in cash or in-kind for joint projects.

The current funding mandate from the Heritage Fund for Farming for the Future Programs expires on March 31, 1997. ARI requests that the budget for Farming for the Future be approved under the General Revenue Fund rather than the Heritage Fund. The shift needs to be decided during the current plan period and implemented by April 1, 1997. Research requires a long-term commitment to meet changing industry needs. Financing Farming for the Future from the General Revenue Fund will be consistent with ARI's long-term direction.

6. **Research Professorship Program** - The purpose of the Research Professorship Program is to raise the research priority of selected target disciplines of importance to Alberta's agricultural sector and intensify the scientific effort directed to them. Four research professorships are currently supported. Three of these professorships (Soil Conservation, Food Packaging, and Marketing of value-added Agricultural & Food Products) are supported at the University of Alberta. One professorship (Animal Welfare and Ethology) is supported at the Western College of Veterinary Medicine.

   This program will have completed its mandate during the plan period and will be phased out as the term of agreement for each professorship expires.

7. **National Agricultural Biotechnology Initiative** - The National Biotechnology Initiative is a program established by the federal government as part of Western Economic Diversification. Its purpose is to support the development and commercialization of agricultural biotechnology. Projects are eligible after a genetically engineered plant, animal or other organism has shown characteristics that are potentially marketable or the new biotechnological method has been successful.

   Approved projects are supported jointly by the company that wishes to commercialize the product, one or more of the four western provinces who find the project of benefit to them, and the Government of Canada, through the Department of Western Economic Diversification. ARI participates in funding projects of particular interest to Alberta.

   During the plan period, projects submitted to ARI under this program will be considered for funding as part of the Matching Grants Program.

8. **Scientific Conference Assistance Program** - The Scientific Conference Assistance Program provides limited financial assistance for scientific conferences. Eligible conferences are those that facilitate the presentation and transfer of research results to agriculture and food production, processing and marketing.

9. **Externally Funded Research Program** - Under this program, ARI administers research funds received from private organizations or public sector funding agencies for specified research projects conducted by the staff of Alberta Agriculture, Food and Rural Development. This program serves as part of ARI's thrust to strengthen cooperation, partnerships and alliances with the private sector and Agriculture, Food and Rural Development.

10. **Information Dissemination Program** - The purpose of this program is to distribute the results of ARI supported projects to Agriculture, Food and Rural Development specialists, producers, processors and all other users. The information is distributed through project reports, articles, publications, and by electronic means.

Strategic Direction

The goals and programs of ARI listed in the foregoing sections express the ARI's broad responsibilities in more specific terms. They set the directions of ARI in the period ahead.

Three Year Strategic Direction

Between 1995/96 and 1997/98, ARI will implement the following strategies:

1. Provide a forum and support for research coordination, cooperation and the development of alliances.

2. Encourage greater private sector financial contribution for research by shifting funding from direct to matching. The impact and effectiveness of the shift should be evaluated in 1995/96.

3. Continue the marketing effort to promote ARI programs and the research capability of Agriculture, Food and Rural Development.

4. Target funding under the Farming for the Future Direct Funding Program to areas of research that are important to Alberta but have limited potential for obtaining financial support from the private sector.

5. Provide the results of research to Agriculture, Food and Rural Development specialists, producers, processors, consumers and others through reports, articles, publications, demonstration projects and electronic means.

6. Examine future options, formulate visions and set far reaching directions to stay on the leading-edge of agriculture and food research.

Ten Year Strategic Direction

ARI is a research coordinating and funding organization. Individual projects funded may change over time. However the broad strategic direction of ARI will remain consistent with the direction listed above. Over the next ten years, ARI will continue to strengthen research cooperation, increase partnerships with the private sector and support research that meets changing needs.

9.3.4 Measurable Results

ARI's mandate ranges from coordinating and supporting research to transferring the results of research to users. Its goals and programs are aimed at putting its mandate into action. The strategies define what ARI can accomplish with the resources available to it over the three years 1995/96 to 1997/98. The following measurable results have been identified to gauge the impact of ARI supported activities and projects on industry and the provincial economy.

1. Effective coordination and cooperation in agriculture and food research (applies to goals 1-4).

2. Increased agricultural knowledge (applies to goals 1-4).

3. Reductions in the unit cost of producing a marketable product because of improved technology or management method (applies to goals 2-5).

4. Increased private sector support for agriculture and food research (applies to goals 1-4).

5. Increases value-added products (applies to goal 2).

6. Contributions to making agriculture more environmentally sustainable (applies to goal 3).

7. Maintaining or increasing the rate of adoption of information from demonstration projects (applies to goal 5).

8. Returns to the provincial economy from research funded under ARI (applies to goals 1-5).

Operations

ARI is governed by a Board of Directors. The Board members are appointed by the Minister of Agriculture, Food and Rural Development as designated in the ARI Act. The majority of the directors are from the private sector. The remainder are from the universities and government agencies. A yearly rotation cycle has been established by the Board to regularly bring on new directors as existing directors complete their term.

The Board has established a number of advisory committees. The members of these committees are drawn from the private sector, the universities and government agencies involved in agriculture and food research. Committee members are appointed for a three year term and a yearly rotation cycle is in place.

The committees evaluate research proposals, consider issues and priorities and examine strategic directions. They submit their recommendations to the Board. Representatives of the agriculture and food industry play vital roles in all ARI affairs.

The Research Division of Agriculture, Food and Rural Development provides administrative support to ARI. All of the day-to-day operations of ARI are managed by the division. ARI employs administrative support staff, but the managerial, professional and some support staff, as well as office space and equipment are provided by the department. ARI, in turn, supplies department staff with the results coming out of the projects it funds to facilitate technology transfer. Thus, the two organizations work very cooperatively, reinforcing and complementing each other's activity. The division disseminates the results of the projects supported by ARI to producers, processors and consumers interested in the information, as well as to department staff.

Service Delivery

ARI uses the competitive research grant approach for funding projects. This approach is cost-effective and involves both industry members and researchers in making recommendations and decisions. Existing capital facilities and researcher expertise can be utilized at minimal added cost.

Applications submitted to ARI for project funding are first evaluated by the appropriate research committee. The Board makes the final decision after taking into account the committee's recommendations.

Coordination of activities with the private sector will be strengthened. More emphasis will be placed on building partnerships and alliances between ARI and private sector organizations.

A marketing effort launched in 1994/95 by Research Division staff to make industry familiar with ARI programs and services and the research capabilities of Agriculture, Food and Rural Development will continue. The central purpose of the marketing effort will be to build strong and mutually beneficial partnerships and alliances in research and the commercialization of results.

ARI will continue to maintain its strong link with Agriculture, Food and Rural Development and rely on the Research Division for administrative support. It is recognized that the Division will have reduced resources and may be forced to make some adjustments in the range of services it provides to ARI.

However, the mutual benefit of maintaining this close and somewhat unique relationship is so strong, a serious effort will be made to accommodate each other.

Evaluation Process

ARI's Evaluation procedure involves two stages - research proposal evaluation and program evaluation. The Institute has established committees in six commodity/resource areas to evaluate proposals. The six research committees consist of producers, specialists and scientists. They conduct peer reviews and evaluate the economic and scientific merits of the proposals.

Research proposals are submitted by November 1 if each year. This allows time for a structured evaluation of approximately two months. After evaluating the submissions, each of the committees will forward their recommendations to the ARI Board for review and final approval. The Board meets in February to make final project selection. All approved projects are then awarded funds on a fiscal year basis beginning each April.

Funding decisions under the On-Farm Demonstration Program goes through a different evaluation process. Applications must be submitted by agricultural producers or producer organizations to a regional committee (one for each agricultural region) comprised of producers and Alberta Agriculture, Food and Rural Development specialists. Producers form a majority on these committees. The committees recommendations are forwarded to the Institute for final consideration.

Program evaluations are conducted somewhat differently from project evaluations. ARI retains outside consultants to evaluate programs at appropriate intervals. The effectiveness of the Farming for the Future research and demonstration programs in serving Alberta's agri-food economy, for example, was reviewed in 1992. ARI hired an Edmonton management consulting firm called Serecon to conduct the economic evaluation of a sample of projects funded under Farming for the Future. Serecon evaluated the economic benefits of ten research projects and ten on-farm demonstration projects. The company estimated a direct economic return to the Alberta Economy of $455.6 million over the next 15 years from these 20 projects alone. The amount invested in the 20 projects was $7.24 million. The Serecon study suggests that every dollar invested in these projects will yield over $60 dollars to the overall provincial economy.

The Strategic Committee of the ARI also has a role in program evaluation. The Committee reviews the effectiveness and direction of programs and recommends changes where necessary. If required, the ARI Board can also strike ad hoc committees to evaluate programs.

Research Coordination

One of the most important responsibilities of the ARI Board is to coordinate research. Many of the Board's efforts will be undertaken specifically in response to that goal.

Coordination starts with the Board's membership structure. The structure is designed to assist with the process of promoting and coordinating agricultural research among performers and users. For instance, having leaders of the province's major agricultural research organizations on the Board enhances agricultural research coordination among those groups. Agriculture and Agri-Food Canada, the University of Alberta, the University of Calgary, Alberta Advanced Education, the Western College of Veterinary Medicine and private sector organizations are represented on the Board.

The Board regularly tours the major agricultural research facilities in Alberta. The tours and the discussions held with researchers from various institutions provided background information needed for Board members to assess the existing level of coordination and to identify areas that require improvement.

Under the Focus on Opportunities Program, ARI organizes formal reviews of ongoing research programs in Alberta as a way of encouraging coordination. The research workshops are undertaken by commodity and discipline areas, with the intention that all major commodity areas will undergo a review every three

years. Participants typically include representatives from all institutions active in the particular research topic, and representatives from producer and processor groups who have a stake in the development of new knowledge and technology in their areas of interest. The exchange of research information during the workshops is expected to strengthen cooperation and coordination of scientific efforts among agricultural researchers in the province.

Further, ARI has established a Research Coordination Program. The Program is designed to provide scientists involved in agricultural research with financial support in order to promote research coordination. Through the program, networking, cooperation and exchange of information among researchers is promoted.

9.3.5 Human Resources

ARI's functions are centred on the products of the human mind. By supporting the creative talents of Alberta's scientific community, ARI is underscoring the value of human resources.

The human resources available to ARI have a range of training, skills and experience. The talent and commitment the Board, Committee members and staff bring to their tasks enable the ARI to meet its goals.

Board and committee members are selected on the basis of knowledge, expertise and association with the agri-food industry. They are not employees of ARI. Private sector members of the Board and committees are paid modest honoraria to partially compensate them for the times spent on ARI business.

A very important part of ARI's human resource is the staff available to it. These include those employed by ARI itself as well as those generously shared with ARI by Agriculture, Food and Rural Development.

ARI employs seven temporary administrative support staff. Managerial and professional services are provided by permanent employees of Agriculture, Food and Rural Development. The ARI support staff perform the necessary computer operations, accounting, administrative and secretarial work. The staff also administers awards for some researchers, which increases the number of administrative functions. They possess the knowledge, skills and motivation necessary to conduct their tasks.

ARI staff have capabilities in a range of areas and are well qualified to effectively carry out ARI's mandate. More specifically, ARI has staff with:

a. scientific and technical knowledge in agriculture and food,
b. research program management skills,
c. financial management and accounting skills,
d. technical and non-technical writing skills, and
e. secretarial, word processing, computer operations and file management skills.

ARI's recruitment policy takes into account ARI's skill needs and is based on hiring the best qualified and most compatible individual for the position. Opportunities for training, skill development and job enrichment are provided to all staff.

ARI currently has the human resources required to implement its business plan. Reductions in the Research Division budget and declines in ARI revenue may force staff reduction during the plan period.

Performance Measures

Internal efficiency and productivity are valued highly by ARI. Its staff are well qualified for their duties and perform their functions exceptionally well. Their productivity will continue to be measured through staff performance appraisals and through overall indicators of ARI's effectiveness.

The effectiveness of ARI hinges on the quality of the recommendations submitted by the committees and the decisions and directions given by the Board. ARI will use the following criteria as indicators of internal efficiency and productivity:

a. the efficiency (output per unit of input) with which the process of collecting, reviewing and funding projects by ARI is accomplished, and
b. the rate at which research results are released to potential users, either through publications or the electronic media.

9.3.6 Implementation Plan

ARI's strategic direction will be implemented in a manner that will protect its core services and keep its expenditures within the resources available to it.

ARI's commitment to research coordination will be maintained. The two programs that have the strongest impact on coordination and cooperation, the Focus on Opportunities Program and the Research Coordination Program, will remain intact.

Efforts will continue to expand private sector support for research. This was started in 1994/95 by increasing ARI's matching contribution.

The marketing effort launched in 1994/95 to increase the private sector's awareness of ARI's programs and services for private sector supported research will continue. Since ARI funds research in private research facilities, universities and government research centres, industry can have access to the expertise and facilities available at these organizations. The research organizations can also benefit from the increased joint funding for research projects. Collaborations, partnerships and alliances will be encouraged through mutually beneficial relationships.

The Research Professorship Program will complete its mandate during the plan period. Each professorship will be phased out as the term of the agreement expires. The Scientific Conference Assistance Program will be discontinued in 1996/97. The accumulated reserve fund will likely be depleted by the end of 1996/97.

Administration costs will continue to be reduced. Care will be exercised to ensure that cutting administrative costs will not defeat or jeopardize ARI's purpose for expanding partnerships with the private sector. Matching Grants projects require substantially more staff time to administer compared to projects funded directly by ARI.

Internal efficiency and productivity will continue to be emphasized. Administrative procedures will be further reviewed for possible streamlining, elimination or replacement with more efficient practices.

Approval is requested to have Farming for the Future programs funded under the General Revenue Fund effective April 1, 1997.

Under Farming for the Future, direct funding will continue to be reduced. The funds will be shifted to the Farming for the Future Matching Grants Program to attract more private sector support for research. The shift will be carried out in a smooth and orderly fashion to minimize disruption in funding on-going, multi-year projects. The impact and effectiveness of the change will be evaluated in 1995/96.

Funding participation under the National Agricultural Biotechnology Initiative (NABI) is being continued under the Matching Grants Program.

9.3.7 Financial Plan

In 1994/95, ARI received a budget of $6.6 million from the Province of Alberta. Of this amount, $4.8 million was from the Alberta Heritage Savings Trust Fund and $1.8 million was from the General Revenue Fund. The following tables show the revenue and expenditure summaries of ARI.

ARI's revenue summary for fiscal years 1994/95 to 1997/98 is shown in Table 9.3.1.

Table 9.3.1
Agricultural Research Institute
Revenue Summary (in thousands of dollars)
for 1994/95 to 1997/98

	1994/95	1995/96	1996/97	1997/98
Alberta Heritage Saving Trust Fund	$4,800	$4,500	$4,000*	$ 0
General Revenue	1,800	1,750	1,688*	5,688
[1]Other Revenues	660	585	351	175
TOTAL	$7,260	$6,835	$6,039	$5,863

[1] Other Revenue = unexpended funds, fees earned, interest earned and other sources

*The current funding mandate from the Heritage Fund for Farming for the Future expires on March 31, 1997. ARI requests that the funding source be shifted to the General Revenue Fund effective April 1, 1997.

Table 9.3.2 shows a four-year expenditure summary. The 1997/98 total ARI expenditure is expected to decline by 19 percent compared to the 1994/95 level.

To implement the ARI direction in a manner consistent with the financial resources available, the following adjustments will be made:

a. Administrative costs will be reduced and strategic committees will be streamlined.
b. The reserve funds will continue to be expended.
c. Funding of four research professorships will be discontinued.
d. The Scientific Conference Assistance Program will be discontinued.
e. Co-funding of the National Agricultural Biotechnology Initiative (NABI) projects will be made part of the Matching Grants Program and considered through the annual competitive application process.
f. Funding under Farming for the Future Matching Grants will be increased and Direct Funding will be decreased. The impact and effectiveness of the shift in funding to matching grants will be evaluated.

Shifting funds from direct funding under Farming for the Future to Matching Grants will result in increased support for research if the private sector is willing and able to contribute funds for research. Some parts of the agriculture and food industry have the means to generate revenue for research. They are, therefore, in a better position to contribute funds for research of direct benefit to them.

Table 9.3.2
Agricultural Research Institute
Expenditure Summary (in thousands of dollars)for 1994/95 to 1997/98

	1994/95 Budget	1995/96 Budget	1996/97 Budget	1997/98 Budget
Research:				
Farming for the Future Direct Funding Program*	$3,500	$2,000	$1,500	$1,500
Farming for the Future Matching Grants Program*	2,355	3,500	3,454	3,278
Other Programs	340	280	45	45
Technology Transfer:				
Farming for the Future On-Farm Demonstration*	600	600	600	600
Research Information	40	40	40	40
Administration	425	415	400	400
TOTAL	$7,260	$6,835	$6,039	$5,863

*The Farming for the Future Matching Grants Program includes AHSTF and GRF funds until 1996/97. In 1997/98, funding for Farming for the Future Matching Grants, Direct Funding and On-Farm Demonstration Programs are anticipated to come from the GRF.

There are, however, a number of research areas that benefit the broader agri-food industry and society at large for which private sector matching support may not be available. Such areas include basic research in agricultural sciences, soil and water stewardship, new commodities needed for diversification, novel processed products and others. It is, therefore, necessary to retain some level of direct funding for these research areas.

Economic evaluations of agricultural research generally show that 50 percent of the benefits of research are received by producers while the remaining 50 percent accrue to consumers or society at large. It is important to ensure that funding for research that relates to areas vital to the broader agri-food industry and society at large continues to receive support.

A significant shift from direct to matching grants is anticipated to cause other changes. For example, increasing matching grants will increase the workload on staff substantially as matching grant projects require increased agreements, accounting, correspondence, monitoring and reporting. A reduction in direct funding will also cause substantially increased competition among researchers for limited funds.

9.4 Alberta Community Development

9.4.1 Executive Summary

The Department of Community Development has no Research and Development (R&D) expenditures as defined within the annual provincial Scientific and Research Activities Overview exercise. What it does have, according to Statistics Canada definitions, is a "Museum Services" component within what is termed by the survey as "Related Scientific Activities" (RSA). In fact, the entire budget of the Cultural Facilities & Historical Resources Division, less expenditures on the Jubilee Auditoria, can be construed as "Museum Services/RSA". The funds provide for the operation of a network of 18 provincial museums, historic sites and interpretative centres; regulatory control over various developments to preserve heritage resources; and assistance to hundreds of community based heritage initiatives across the province. Basically, the Division is in the education, cultural preservation and cultural tourism business, rather than being what is classically perceived as a research institute.

9.4.2 Foundation

Environmental Issues/Industry & Government Needs

- Alberta is a province with a great wealth of human and natural history, and a diverse resource base reflecting that heritage. That physical resource base includes countless artifacts, specimens, documents, structures and sites that are authentic and tangible evidence of our past, and the natural and cultural landscapes of this province.

- The resource base is threatened by pressures ranging from natural ageing and weathering to competitive development pressures.

- Traditionally around the world, heritage resource conservation and development initiatives have been largely a publicly-demanded and funded effort, seen as part of the maintenance and education of a healthy society.

- Since constitutionally the responsibility for resource management rests in large part with the Province, the Government of Canada's activities in the heritage resources area in Alberta are primarily confined to regulation of the export of Canadian cultural property, the operation of two national historic parks, and some limited cost sharing to develop other heritage attractions of national significance within Alberta.

- Alberta municipalities have widely varied approaches to heritage conservation. These range from limited participation to significant levels of sponsorship of local museums, development of heritage advisory boards, local heritage resource inventories, restoration of early public buildings, historical plaque programmes, and involvement in heritage main street and conservation district initiatives.

- While public interest in heritage resource conservation was evidenced at the very formation of Alberta as a province (e.g. Historical Society of Alberta Act of 1907), the demand for preservation and development has increased significantly over the last twenty-five years. In 1967 the Provincial Museum and Archives was opened. In the early 1970s public hearings brought about provincial heritage legislation and associated programmes. In the 1980s and early 1990s a large network of world class, provincially operated museums, interpretative centres and historic sites was established in response to the public demands of the communities and regions in which they were located. During this same period, the number of community museums increased from several dozen to over 200, involving some 7,000 volunteers and 3,000 staff. Over thirty community archives were also established, and approximately 200 other community based heritage projects ranging from historical building preservation to local history

books now occur in Alberta annually. During this twenty-five year period, heritage building restoration and recycling in Alberta also evolved from a rare phenomena to a popular and frequent business practice. Heritage programming in schools and historical publications have also increased significantly.

- In the last two decades, a significant component of Alberta's business community has been drawn to the economic benefits of historical resource development, both as cultural tourism attractions and as low cost or competitive high quality business environments. Tourism is becoming the world's largest industry and an increasingly important element of Alberta's economy. Heritage building recycling is environmentally friendly, is labour (not materials) intensive, and in the last twenty years has become a strong alternative to, and in many areas the preference over, new construction.

- The Government of Alberta has shown keen interest in seeing expansion in its tourism industry, and recognizes the role of historical resources in this field:

  . . . target tourism industry receipts of $4.4 billion by the year 2000 (from the current $2.3 billion) . . . (from "Alberta's New Economic Strategy" in A Financial Plan for Alberta: Budget '93)

  Alberta should focus its energies on developing economic sectors which over time can create wealth and employment....tourism, culture and sports which encourage both Albertans and others from outside the province to spend their money here [met these criteria]. Tourism offers wonderful opportunity for economic development in rural areas (from Towards 2000 Together).

  The latter report goes on to stress the importance of environmental protection, the government's custodial role in heritage preservation, and the linkages between environment and the economy.

  Alberta has developed a number of historical attractions, some with international appeal and significance. This network of attractions, such as the Royal Tyrrell Museum of Palaeontology and Head-Smashed-In Buffalo Jump, is continuing to grow, and with their associated interpretative services, will provide an important dimension to visitor activities. Opportunities exist to supplement this network and integrate existing heritage resources into coherent packages". (from Tourism 2000: A Vision for the Future).

- Several provincial and national studies show heritage attractions are specifically cited by one-third of all tourists as a motivation for their trip. Alberta's provincially owned heritage facilities alone attract approximately 1.1 million annually and generate some $55 million in provincial economic activity. In total, Alberta's museums receive 5.5 million visitors annually. Some 10,000 Albertans staff these facilities, and several times more work in the service sectors dependent on the associated cultural tourism. Much of the original justification for Alberta's substantial investment in heritage has been the diversification, decentralization and strengthening of the economy. The network of provincial heritage facilities was designed to create new tourism patterns across the province, and has succeeded in meeting the visitor projections on which they were predicated. Since the late 1970s these attractions have all been built in smaller Alberta communities, and more and more communities are anxious to be part of this new tourism success.

- Albertans have expressed a need for better access to government records, resulting in new "access to information" legislation. As the primary steward of Alberta's documentary heritage and all early provincial government records, the Provincial Archives will face the challenges of the new accessibility requirements.

- From its peak in the mid-1980s, Divisional staffing has decreased by 71 FTEs and budgets reduced by over $9.4 million. Since 1983/84, 12 new facilities and 2 transferred auditoria have been added to the unit. In other words, **GRF budgets have decreased by 40% and associated manpower is down 20%, during a period where facility responsibilities have increased by approximately 50%.**

Vision and Mission

Departmental Vision Statement

To build a strong province with a high quality life for all Albertans through the provision of a range of affordable core services and programs based upon identified community needs; a province in which people have a richness of opportunity and choice; a province where people can live happy, productive and stimulating lives.

Departmental Mission Statement

To help communities to achieve their goals, and through leadership, protection and partnerships, to help all Albertans participate fully in the social, cultural, and economic life of the province.

Divisional Vision and Mandate

The Cultural Facilities & Historical Resources Division will seek to maximize the cultural, educational, social, scientific and economic returns of its facilities and programs for Alberta and its communities.

The mandate of the Division is to fulfil the responsibility of preserving and interpreting Alberta's historical resources as articulated in the Historical Resources Act, and to operate the Jubilee Auditoria that serve Albertans as a cultural window on the world.

9.4.3 Relevant Departmental Objectives and Related Divisional Core Programs, Products and Services

- *To increase the economic returns of cultural & heritage facilities:*

  Historical Facility Management - This program provides for the delivery of thematic and curriculum-based programs and exhibits at 18 provincially operated historic sites and museums across Alberta.

- *To increase appreciation for and the preservation of Alberta's diverse natural, historic and cultural resources:*

  Cultural Resources Management - This program provides for the acquisition, management and public accessibility of approximately 2 million historic and scientific artifacts of provincial, national, and international significance, as well as 18 shelf-kilometres of both government and private sector records and multi-media resources deemed of enduring historical value to the Province of Alberta. Cultural Resource Management deals with the review and assessment of land-based development activity within the province in order to identify and preserve significant palaeontological, archaeological and historical resources. The program also provides professional and technical advice to both government and private sector groups and agencies and individuals involved in heritage preservation, museum initiatives and natural history investigations. Aside from conserving the resource base, this program is essential to developing and maintaining appropriate facility operations.

- *To increase the number of communities that manage their own heritage resources:*

  The Alberta Historical Resources Foundation - The Alberta Historical Resources Foundation, with technical and administrative support from Alberta Community Development, channels lottery funds to communities for the development and care of their own heritage resources. Projects range from historical building preservation/restoration, to heritage districts, to interpretative markers, publications

and educational projects. During 1993/94, the Foundation sponsored and the Division advised over 200 community heritage initiatives across the Province, each of which strengthened the local economies while increasing community spirit, well being, and quality of life. Many of these projects provided for low cost urban revitalization while preserving local landmarks. For the sake of efficiency and economy, the Division handles Foundation administration and Board support, and assists clients with technical, research, project planning and restoration advice.

9.4.4 Goals and Measurable Results

General Budgeting Approach

To meet the challenges of budget reduction targets, the Cultural Facilities & Historical Resources Division has **fundamentally changed its operating philosophy from a virtually total dependence on General Revenue Funding towards increased self-sufficiency and cost recovery** in those operations that so allow. Most of this facility-based unit is geared towards tourism and interpretative cultural presentation, lending itself to a wide variety of revenue generating opportunities. Other policy, regulatory, educational, and resource stewardship programs have few of these cost recovery possibilities, and will continue to require GRF support as part of their core responsibilities. In the end, **the Division's plan is to provide core services at considerably less cost in tax dollars, with program enhancement initiatives funded by alternative revenue sources.**

This section of the plan explains how budget targets will be met, what each revenue source will provide, and examines specific performance measures to monitor Divisional progress.

Strategies for Achieving Budget Targets

Faced with a restrained economic climate, increased client demands, and benefiting from the experience of nearly three decades of programming, the Division has selected the following four goals to be accomplished through its business plan:

- **Maintain and Refine Core Programs**
- **Increase Revenue Generation and Entrepreneurial Activity**
- **Increase Partnerships and Community Cooperation**
- **Improve Marketing**

Goal 1

- **Maintain and Refine Core Programs**

There are two pertinent questions: "Are we doing what we are supposed to and in the best way possible?" Activities will be prioritized regularly, with critical core services as focal points.

Strategies

1. Legislative mandate (Historical Resources Act) to be publicly reviewed. (NOTE: Initiation of formal review of the Act has been postponed until 1996/97).
2. Through continuing assessments of the efficiency and effectiveness of all Divisional activities, core programs will be re-examined, and non-core programs will be prioritized according to set criteria.

3. Public input and community linkages will be established to confirm service needs and to ensure a client-driven system.

4. Administrative costs will be continually re-evaluated and streamlined where possible.

Measures

1. Historical Resources Act Review: number of participants; nature of changes; acceptance of changes by Legislative Assembly.

2. Program Reviews: Service cost analyses; unit costs for relevant products.

3. User Satisfaction Surveys: Annual visitor surveys (demographics, design & satisfaction, and economic impact) at facilities; special purpose surveys (e.g. exhibit testing, educational value) as needed; regular contact between staff and visiting public, and regular media monitoring. Other clients (e.g. developers, teachers, other departments, municipalities, etc.) will also be surveyed periodically.

4. Office Procedures Review: Client access; submission process, handling, conveyance within system, approvals, conveyance to clients, and filing all to be evaluated on a regular basis.

Goal 2

- **Increase Revenue Generation and Entrepreneurial Activity**

Where possible within regulatory constraints, and with increased support from central agencies, staff will be given flexibility and incentive to be entrepreneurial, and the pursuit of profit must also allow for the risk of occasional failure. In general, revenues will be retained by originating profit centres.

Strategies

1 GRF Offsetting: As much as possible, GRF reductions will be offset with self-generated revenues.

2. Maximization of Facility Admissions Revenues: This requires bringing the optimum number of visitors through the doors, and offering a valued experience.

3. Maximization of Parking and Rental Revenues: At appropriate urban facilities, parking charges at appropriate levels can be a significant revenue source, as can the rental of public meeting rooms, auditoria and photographic stage sets at many facilities.

4. Maximization of Benefits from Food Services and Gift Shops: The emphasis on increasing revenue requires re-examination of all amenities contracting in order to maximize the benefits of Divisional activities. Some renegotiation with Public Works, Supplies & Services will be required. Benefits may come in forms other than lease revenues; an example would be marketing assistance from a co-operating agency.

5. Maximization of Cost Recovery Projects: Through the Historic Resources (Regulated) Fund (consisting primarily of admissions revenues) the Division has the ability to invest in itself, and allow entrepreneurial ventures within the public service (e.g. rides, special charge programs and exhibits, specimen casting, etc.). Considerable experimentation will be required to examine possibilities and maximize profits, given increased support and manoeuvrability from central regulatory agencies.

Measures

1. Revenue Offsetting: Comparison of GRF reductions against gains in Historic Resources Regulated Fund income.

2. Attendance Monitoring: Daily, weekly, monthly, annual tracking of attendance at all facilities; comparisons of facility to facility and external attractions; market share analysis.

3. Comparisons: of parking/rental rates from year to year, and event to event; of additional revenues from rate increases to first-time implementation; of the relative number of rental days per space; of service/capital cost monitoring; and of public user surveys.

4. Comparisons: of revenues from facility to facility, and to commercial rates; service/capital cost monitoring; public user surveys.

5. Periodic tracking: of cost/benefits for all cost recovery projects; of annual reviews of profitability and service delivery; of trend analysis establishing better investment options.

Goal 3

- **Increase Partnerships and Community Cooperation**

The Division offers individuals, groups, communities and the private sector numerous opportunities for involvement in prestigious world class heritage programs that serve Albertans and visiting tourists alike. Some of these opportunities are solely for personal or corporate benevolence, and others offer mutual benefits in development and marketing.

Strategies

1. Volunteers: The Division will maintain or increase this alternative manpower source.

2. Cooperating Societies: Will maintain or increase these complementary service groups.

3. Other Group/Agency Cooperation: Will appeal to more existing and external groups for shared projects, in-kind contributions and grants.

4. Donations: Will increase cash, in-kind services, and artifacts; from both private and corporate sources.

5. Corporate Cooperation: Will increase corporate partnerships in developing exhibits, in offering special events, in building collections, in educational programming, and in marketing.

Measures

1. Manpower Inputs: number of volunteers/groups/sponsors at each facility; number of volunteer hours, productivity of volunteers, cost of administering volunteer programs, will all be regularly monitored.

2. Resource Inputs: Revenue raised/service provided/assets acquired.

3. Cost to Service Partners: Training time; staff time in meetings and supervision; enhancement of facility reputation.

4. Community Linkages: number of ties from facilities to communities.

Goal 4

- **Improve Marketing**

With a significant base of 1.1 million visitors annually, the Division can nonetheless build a stronger Alberta audience and increase its tourism market share, both to increase an appreciation for heritage and to build facility revenues. The Division will also pursue strategies to respond positively to uncontrollable variables in annual tourism, such as bad weather patterns, unfavourable exchange rates and variable international travel trends.

Strategies

1. Better market definition and targeting are required to place marketing dollars where they produce maximum benefits.

2. More marketing mechanism testing to determine which media are most effective.

3. More cooperative marketing needed to expand the impact of the Division's limited marketing dollars and develop more salesmen/ambassadors for the product.

4. Building American tourist visitation market share is a priority.

Measures

1. Comprehensive demographic surveys at all facilities and comparisons with competitive attractions; comparison of resources spent on traditional audiences against building new audiences and addressing gaps.

2. Number of cooperative marketing ventures, magnitude of partners' investment in cooperative marketing, monitoring partner benefits, benefits (increased audience) to the site/facility.

3. Number of American visitors to sites, duration of stay, satisfaction rating, economic impact.

9.4.5 Financial Plan, Human Resources, and Implementation

The Cultural Facilities & Historical Resources Division has implemented, and will continue to develop, a five-pronged approach to budgetary administration and revenue maximization.

Core programs and the regulatory functions performed by the Division will continue to be funded from **General Revenue Fund** budgets.

Entrepreneurial ventures and cost-recovery programs, primarily at the operating museums and historic sites, are facilitated through the **Historic Resources (Regulated) Fund**. This fund, which provides for the use of funds at the specific facilities which generate them, is unique in the provincial government system.
Facility and program enhancement initiatives are pursued through the efforts and assistance of **Associated Cooperating Societies**, commonly known as Friends societies. These societies operate as private, not-for-profit groups at most of the operating museums and historic sites in the province.

Lotteries Funding, through the Alberta Historical Resources Foundation, is channelled directly to the communities of Alberta for the express purpose of supporting heritage preservation projects. These projects are administered through the Foundation with the technical assistance of Divisional staff.

The following section details a multi-year Divisional budgetary plan for each of these four sources of funding.

1. General Revenue Fund Budgets

Following is a chart indicating the provision of manpower and financial resources from the General Revenue Fund for the Division and its associated Branches.

DIVISION: Historical Resources Division

	Actual	ESTIMATES				
	1992-93	**1993-94**	**1994-95**	**1995-96**	**1996-97**	**1997-98**
Full Time Equivalents	280.0	252.0	248.5	243.0	225.5	225.5
Grants	$37,247	25,000	25,000	25,000	25,000	25,000
Operating	16,503,789	15,312,320	14,580,082	14,115,394	13,481,219	13,481,219
Capital Assets	185,563	203,330	203,330	193,093	193,093	193,093
Total	16,726,599	15,540,650	14,808,412	14,333,487	13,699,312	13,699,312
Cumulative Change		-7.1%	-11.5%	-14.4%	-19.1%	-19.1%

Notes:

1. The Glenbow-Alberta Museum's 1992/93 Operating Grant ($3,373,000 from GRF) is excluded. In subsequent years, this is dealt with through Lotteries funding. The only remaining grant (listed) is for the Government House Foundation.

2. In 1993/94 nearly $300,000 in manpower reductions were made, largely through voluntary severance allowance programmes and vacant positions. The Divisional budget will see another $1.2 million manpower reduction over the next three years; however, this will be largely converted to contract positions paid from internally generated revenues.

3. All calculations exclude the budgets and manpower of the Jubilee Auditoria, which do not fall within "Museum Services/RSA" definitions.

2. Earned Revenues: The Historic Resources (Regulated) Fund

This fund was created in the fall of 1991 to allow revenues from admission charges and other associated goods and service fees to be returned to the provincial museums, historic sites and interpretative centres which generate the funds. This decision was made to retain the economic benefits of these facilities in their originating communities, and inspire entrepreneurship both amongst staff and by the hosting community itself. This fund is unique within the Alberta Government, and is serving as a model for other departments now planning alternative resourcing, and is creating increased entrepreneurialism within the public service.

To increase self-generated revenues, the Division is looking to implement $1.00 admission fees at smaller sites; increase admission charges at larger facilities to international standards; implement a parking charge at the Provincial Museum; implement a charge for designation and archaeological permits and reviews; recover

revenues from the Jubilee Auditoria for parking, admissions, and surcharges from agencies, and implement other new entrepreneurial ventures.

By 1996/97, these changes will result in earned revenue increases of $4.2 million over and above the 1993/94 base of $2.1 million. This level of increase is dependant in large part on the Jubilee Auditoria being able to retain all income from all sources. Retention of these funds is contingent on completion of negotiations with Public Works, Supply and Services, and the circumstances could change substantially if the facilities are partially or fully corporatized.

Two sensitive issues will be addressed in this earned revenue generation plan. First, fees will be increased gradually and visitors must be fully satisfied, as the change could lower attendance and be counterproductive to the intent of the plan. Secondly, these facilities were originally justified not for their direct return revenue potentials, but rather on their ability to stimulate tourism business in surrounding service sectors. Facility enterprises must therefore be careful not to compete too directly with the very service sector businesses which the facilities were intended to assist. The original and continuing Divisional intention is to promote enterprises which can help offset operating costs and maintain quality attractions, while increasing the duration of visitor stays and their expenditures in the local service economies.

This system encourages facility staff to be entrepreneurial within cooperative community and regional economies, as facility budgets will be enhanced by their product, marketing and community relations success. These earned revenues will be used to fund exhibit maintenance and periodic redevelopment, site operations expenses, promotional costs, and other needs oriented to public service. It is vital that displays, facility maintenance and programs remain world class if the network of facilities is to retain or build market share.

The following charts indicate the scheduling for these measures and the revenues expected from each branch and facility in the Division. The first three charts provide a summary of the three-year **Revenue Generation Plan for the Historic Resources (Regulated) Fund**, showing specific activities within each Branch and their schedule for implementation. The fourth chart following details budget projections for the life of this plan.

Two of the regulations governing the Regulated Fund merit mention at this juncture. The first is that the Fund cannot enter into a deficit position, though a portion of funds can be carried forward from year to year to allow for cushion against uncontrollable variables within the projections. As the fourth chart indicates, modest surpluses are projected every second year to allow for this cushioning effect. The second regulation is that the money within the Fund can only be expended at the facilities contributing to the Fund, with the expectation that the long-term average of expenditure at any one facility will approximate the revenue generated at that facility. It will be noted that the projections reflect greater or lesser proportions of expenditure relative to revenue at individual facilities within a given year, in order to accommodate the cyclical needs of capital re-development at other facilities. The principle followed is that each facility contributes according to ability and withdraws according to need on a rotating basis, thereby allowing for the enhancement of the entire system of museums and historic sites across the province.

Additional initiatives beyond 1996-97 are currently under consideration.

Historic Resources (Regulated) Fund - Revenue Generation Plan

PROVINCIAL MUSEUM	1994-95	1995-96	1996-97
Discontinue "Free" Tuesdays	11,000	11,000	11,000
Parking fee		100,000	100,000
Archaeology fees		37,500	37,500
Admission fee increase			150,000
YEARLY SUB-TOTALS - PMA	11,000	148,500	298,500

ROYAL TYRRELL MUSEUM	1994-95	1995-96	1996-97
Discontinue "Free" Tuesdays	69,500	69,500	69,500
Field Station admission fee		23,000	23,000
Admission fee increase			250,000
YEARLY SUB-TOTALS - RTM	69,500	92,500	342,500

NOTE: The operation of the Tyrrell Museum Gift Shop, currently contracted to an outside party, will be assigned to the Friends Society in 1995/96. The Society will realize a significant increase in revenues as a result (see "Associated Co-operating Societies", below).

HISTORIC SITES & ARCHIVES SERVICE	1994-95	1995-96	1996-97
Discontinue "Free" Tuesdays	69,500	69,500	69,500
Designation application fees		2,500	2,500
Implement $1 admission fee at:			
-Stephansson House		4,000	4,000
-Victoria Settlement		3,000	3,000
-Brooks Aqueduct		1,000	1,000
-Cochrane Ranche		4,000	4,000
-Historic Dunvegan		4,000	4,000
-Rutherford House		6,000	6,000
-Leitch Collieries		1,000	1,000
-Ft.George/Buckingham House		3,000	3,000
-Father Lacombe Chapel		1,000	1,000

Admission Fee increases at:			
-Head-Smashed-In Buffalo Jump			90,000
-Reynolds-Alberta Museum			78,000
-Frank Slide Centre			24,000
-Ukrainian Village			28,000
-Ft.McMurray Oil Sands Centre			10,000
-Remington Carriage Centre			30,000
YEARLY SUB-TOTALS - HSAS	69,500	99,000	359,000
YEARLY TOTALS	150,000	340,000	1,000,000
DIVISIONAL GRAND TOTAL - 3 YEAR HRF REVENUE, 1994-97			**1,490,000**

3. Associated Co-operating Societies Funding

Eighteen co-operating societies in the province operate in partnership with facilities, sites or programs within the Division. Thirteen of these are dedicated "Friends" societies, formed for the sole purpose of enhancing programming and assisting in fund raising activities at the facilities. In the remaining instances, the Division has entered into co-operating agreements and/or contracts with existing community organizations, such as local museum or historical societies, which then perform many or all of the same functions as a dedicated Friends society. This partnership approach is mutually beneficial to the community organizations and the Division, and prevents the duplication of efforts and competition which might otherwise be caused by the formation of a dedicated Friends group. It allows the existing community organization to continue on with its original purposes while providing the Division with local assistance in the operation of its facilities and sites.

As private sector (and in some instances charitable) organizations, the co-operating societies enjoy a measure of operational and financial flexibility currently unavailable within the civil service. As a result, the societies are able to enter into innovative fund-raising ventures; access grants and other types of financial assistance; contract for services; and provide for manpower assistance with minimal administrative difficulty. With local and regional representation on their governing boards and councils, the co-operating societies have proven invaluable in the marshalling of volunteer assistance for special events and exhibitions.

Formal agreements and a continuing consultation process provides for the re-investment of funds earned at a particular facility by the co-operating society in the programs of the facility. At many of the larger facilities, Friends societies operate or administer the Gift Shop and Cafeteria functions; at the smaller sites, the societies generally are charged with the responsibility of collecting and administering donations and other revenue generating programs.

In recognition of the considerable assistance and benefits to the facilities provided by the co-operating societies, and in recognition of the administrative costs incurred by the societies in providing that assistance, the Division annually provides a nominal operating grant to the societies to defray a portion of the costs incurred. This grant in effect acts as "seed" money, allowing the societies to engage in programs and activities which yield a magnified financial return.

HISTORIC RESOURCES (REGULATED) FUND
OPERATING BUDGET PROJECTIONS

ADMISSIONS REVENUE & EXPENDITURES

FACILITY	93/94 ACTUAL		94/95 PROJECTED		95/96 PROJECTED		96/97 PROJECTED		97/98 PROJECTED	
	REVENUE	EXPENDITURE	REVENUE	EXPENDITURE	REVENUE	EXPENDITURE	REVENUE	EXPENDITURE	REVENUE	EXPENDITURE
ROYAL TYRRELL MUSEUM	981,000	844,000	1,256,000	1,256,000	1,319,000	1,300,000	1,385,000	1,350,000	1,385,000	1,340,000
PROVINCIAL MUSEUM	193,000	216,000	355,000	573,000	373,000	345,000	391,000	390,000	391,000	380,000
HEAD-SMASHED-IN	297,000	162,000	328,000	287,000	344,000	300,000	362,000	415,000	362,000	400,000
REYNOLDS MUSEUM	226,000	98,238	380,000	321,000	399,000	360,000	419,000	465,000	419,000	425,000
REMINGTON CARRIAGE CENTRE	97,000	70,000	140,000	213,000	147,000	140,000	154,000	210,000	154,000	176,000
UKRAINIAN VILLAGE	126,000	80,000	152,000	154,000	160,000	155,000	166,000	166,000	166,000	150,000
OTHER HISTORIC FACILITIES	92,000	98,732	105,000	355,000	128,000	120,000	134,000	155,000	134,000	130,000
YEARLY TOTALS	2,012,000	1,568,970	2,716,000	3,159,000	2,870,000	2,720,000	3,151,000	3,151,000	3,151,000	3,001,000
ACCUMULATED SURPLUS	+443,000		0		+150,000		0		+150,000	

The co-operating societies associated with the Division provide significant budgetary resources, and are an important element in the overall financial picture of the Division. Since the Cooperating Societies are arm's-length agencies fully responsible for their own operations, valid budget projections, which are subject to a wide range of variables, can only be made by the individual societies. The Division expects that Associated Cooperating Society assistance and participation will continue at or above the levels experienced at present.

4. Lotteries Funding: The Alberta Historical Resources Foundation

The Alberta Historical Resources Foundation, a crown agency operating within the Division, is financed primarily through Alberta Lotteries contributions. The Foundation's primary responsibility is to assist in the preservation and interpretation of Alberta's history through the sponsorship of community heritage initiatives. The Foundation is assisted technically and administratively by staff of Alberta Community Development, while policy decisions and sponsorship adjudications are made by a volunteer public Board composed of citizens with a wide variety of professional backgrounds from different regions of the province. **It is noteworthy that the Division does not receive any operational budget from Lotteries monies; the entire principal amount of Lotteries support is passed on to Foundation clients.**

Following is an excerpt of the Foundation's three year business plan, which outlines projected revenues and programme expenditures.

TABLE 9.4.1 - ANNUAL REVENUE PROJECTIONS - FOUNDATION PROGRAMMES - ZERO BASE BUDGET

SOURCE	93/94	94/95	95/96	96/97
Lotteries	$3,350,000	$3,350,000	$3,350,000	$3,350,000
Interest	200,000	200,000	220,000	240,000
Heritage Canada Grant	34,000	40,000	40,000	40,000
Membership Fees	5,500	5,500	7,500	7,500
Donations	4,000	4,000	6,000	6,000
Miscellaneous	500	500	1,000	2,000
INTERNAL REVENUE	$3,594,000	$3,600,000	$3,624,500	$3,645,500

TABLE 9.4.2 - ADDITIONAL LOTTERIES REQUIREMENTS THROUGH THE FOUNDATION LICENSE

SOURCE	93/94	94/95	95/96	96/97
Glenbow-Alberta Institute	$3,200,000	$3,200,000	$3,200,000	$3,200,000
Ex Terra Dinosaur Project	$1,940,000	-	-	-
Western Heritage Centre*	$3,000,000	-	-	-
Subtotal	$8,140,000	$3,200,000	$3,200,000	$3,200,000
TOTAL REVENUE	11,734,000	$6,800,000	$6,824,500	$6,845,500

* AHRF will release $3 million in escrow for the WHC Society as conditions are met.

TABLE 9.4.3 - Annual Internal Foundation Expenditure Projections -- 0 Base Budget

COMMUNITY HERITAGE PROJECT SPONSORSHIP:					
EXPENSE	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**
Heritage Preservation	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Heritage Awareness	300,000	300,000	300,000	300,000	300,000
Main Street Programme	350,000	600,000	600,000	600,000	600,000
Heritage Districts	250,000	-	-	-	-
Transport. Artifacts	100,000	100,000	100,000	100,000	100,000
Soderstrom Scholarship	3,000	3,000	3,000	3,000	3,000
Special Projects	2,550	13,550	48,050	74,050	74,050
SUBTOTAL	2,005,550	2,016,550	2,051,050	2,077,050	2,077,050

FOUNDATION COMMUNICATIONS & ADVISORY SERVICES:					
EXPENSE	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**
Journal & Main Street Staff** - **SUBTOTAL**	105,000	105,000	105,000	105,000	105,000

** Some offsetting grants, membership fees and donations are in this area.

PROVINCIAL HERITAGE ORGANIZATION SUPPORT FROM FOUNDATION:					
EXPENSE	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**
Alberta Museums Association	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Archives Society of Alberta	100,000	100,000	100,000	100,000	100,000
Historical Society of Alberta	51,450	51,450	51,450	51,450	51,450
Alberta Genealogical Society	17,000	17,000	17,000	17,000	17,000
Archaeological Soc. of Alberta	10,000	10,000	10,000	10,000	10,000
SUBTOTAL	1,378,450	1,378,450	1,378,450	1,378,450	1,378,450

FOUNDATION ADMINISTRATION:					
EXPENSE	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**
Clerk, Offices & Board Costs - **SUBTOTAL**	105,000	100,000	90,000	85,000	85,000

	93/94	**94/95**	**95/96**	**96/97**	**97/98**
TOTAL FOUNDATION EXPENDITURES	3,594,000	3,600,000	3,624,500	3,645,500	3,645,500
BALANCE	0	0	0	0	0

EXPECTED RESULTS AND PERFORMANCE TARGETS FOR DIVISION

To ensure success, a multi-year business plan must include a mechanism by which success can be measured. As this document is being prepared, a comprehensive departmental performance management system is in development, under the direction of a government-wide initiative to establish benchmarks and performance indicators within all departments.

Following are performance measures and indicators under consideration, many of which will be developed further to provide benchmarks and performance indicators for the Division. As the departmental and governmental systems are defined, a precise set of divisional indicators will be established incorporating some or all of the following elements.

Expected Results to be achieved by 1996/97	**Selected Performance Targets**
• **Maintain and Refine Core Programs**	
Maintain High Customer Satisfaction	Maintain 85%+ rating of meeting expectations of visitors to heritage facilities
	Maintain 80%+ of "above average" or "excellent" learning experience by visitors
	Review of heritage legislation through public hearings and House review (to begin in fiscal year 1996/97)
Maintain/Improve Collections Care	Increase museum collections holdings from 2 million pieces to 2.2 million (+10%)
	Maintain museums collections backlog of no greater than 10% of total holdings
	Decrease maintenance cost per museum artifact from $1.50 to $1.10 (-27%)
	Decrease cost of archival record maintenance from $55,000 per shelf-kilometre to $45,000 (-22%)
	Maintain 550 institutional loans of artifacts annually
	Increase protected (designated) heritage sites from 315 to 360 (+14%)

• Increase Revenue Generation and Entrepreneurial Activity	
Increase Revenue Offsetting	Increase revenues at heritage facilities from $2.1 million to $3.4 million (+62%)
	Increase revenues as a portion of gross costs from 11% to 18%
	Decrease cost per visitor by 5% annually
	Decrease cost per head of population for heritage from $5.56 to $5.07 (-12%)
	Decrease GRF cost per visitor at Jubilee Auditoria from $1.50 to $1.20 (-20%)
	Increase direct revenue per patron at Jubilee Auditoria from $1.20 to $1.50
	Increase Jubilee self-generated revenue from $l.3 million to $1.6 million annually
Increase Economic Impact	Increase regional economic impact of heritage facilities from $30 million to $35 million annually
	Increase provincial economic impact of heritage facilities from $50 million to $60 million annually
• Increase Partnerships & Community Cooperation	
Increase community partnerships and involvement in programming and events	Increase corporate & individual donations to heritage facilities (amounts variable)
	Increase corporate partnerships at all facilities (amounts variable)
	Maintain 1,500 volunteers at heritage facilities
	Maintain assistance to 200 community heritage initiatives annually
	Maintain 14 citizen advisory boards and 18 cooperating societies with 4,500 members for heritage facilities & programs
• Improve Marketing	
Increase attendance	Increase annual attendance at heritage facilities from 1.1 million to 1.2 million
	Increase attendance by American visitors by 5% subject to international trends
	Increase number of cooperative marketing ventures by 5% annually

9.5 ECONOMIC DEVELOPMENT AND TOURISM

9.5.1 Foundation

> "Science, technology, and industrial innovation are critical components of economic growth and diversification. It is clear that the old industrial economy is giving way to a new economy that is centred on information and leading-edge technologies. Investment in new technology and its commercialization is essential to keep pace with our competitors, and to generate wealth and create jobs. Science and technology is one of the main economic drivers of the 1990s, and is a substantial creator of wealth and jobs in our province. In the future, we must rely on the skills and ingenuity of our workforce to add value to both traditional and new economic activity." *Seizing Opportunity*

In terms of development and application of advanced technologies - products, processes, and related business services -- Alberta has both established strengths upon which to build, and emerging opportunities that can be developed. The Alberta resource industries have the potential to add further value to their product lines and at the same time create new jobs and wealth. To these ends Economic Development and Tourism provides facilitation, information and, in selected areas, collaborative support and leveraged funding with industry, federal agencies, and Alberta's research community.

Needs and Opportunities

Broad examples of needs and opportunities include:

- increasing the utilization of advanced technologies in the resource and manufacturing sectors;
- developing new and improved products and processes in the forest products industry to increase resource utilisation and recovery, and find new uses for residue streams, while reducing environmental impacts;
- attracting new companies to, and developing new capabilities within, Alberta's established telecommunications and electronics industrial clusters;
- increasing, on provincial, national, and international levels, industrial support for research and development and use of Alberta's major research infrastructure facilities;
- enhancing technology and knowledge transfer, application, commercialization, and spin-off company-development from Alberta's research-intensive universities and colleges;
- facilitating the development of effective business and technology networks, with a particular emphasis on small and medium business enterprises.

Mission

The mission of Economic Development and Tourism is to sustain and enhance a favorable business climate and infrastructure that promotes a competitive private sector in the province, allowing the generation of new wealth and jobs for Alberta.

Goals

The department is responsible for developing the course of action required to achieve the goals proposed in *Seizing Opportunity: Alberta's New Economic Development Strategy.* The goals are identified as:

1. Address fiscal issues
2. Stimulate research and development
3. Build on strengths
4. Support strategic opportunities for wealth creation
5. Stimulate community-based economic development
6. Change the regulatory environment
7. Enhance Alberta's international strategy
8. Build intergovernmental partnerships
9. Pursue job creation and skill development

As a vehicle for facilitation, support, and promotion of economic development, based on improving industry competitiveness, business activities of the Department are aligned with those goals. Within that context the S&T activities are focused on:

- support development of new and improved products and processes;
- facilitate company development and growth including export of products;
- support technology infrastructure;
- enhance knowledge and technology transfer and human resource development;
- contribute to developing public awareness and appreciation of the contribution of science and technology to economic growth and quality of life.

To address this mission and goals the department is structured to focus its efforts on the following areas:

Information Technology

- telecommunications, multi-media technologies, electronic networks, computing hardware and software, courseware, and distance education applications;

Advanced Technologies

- electronics and microelectronics, laser technology, advanced materials and processes, biotechnology and pharmaceutical research;

Technology Application

- promoting the application of advanced and information technologies in sectors such as environmental services, the space industry, remote sensing, advanced manufacturing, and medical devices;

- encompassing activities related to transfer of knowledge and technology from research institutes, universities, government agencies and industrial research labs to the private sector for commercial development.

- promote the creation of wealth and jobs by working with the private sector to add value to Alberta's forest resource. The programs are intended to :

    - improve the competitiveness of the forest products industry
    - assist the industry in securing and expanding access to international markets
    - increase and diversify value-added processing of forest products
    - promote forest product research and development in Alberta, and
    - encourage the adoption of the latest technologies, training and management practice by the industry.

Key Success Factors

There are a number of external factors and trends shaping the global economy today that will have a significant impact on the environment in which the department operates.

The Emergence of a Knowledge-Based Economy - New information-intensive technologies are providing the basis for a fundamental transformation and restructuring of industry worldwide. Not only are these technologies being used to develop new knowledge-based industries, they are having a significant impact on existing methods and approaches to production in the resource and manufacturing sectors.

A Focus on International Competitiveness - With the growing trend toward more liberalized trade maintaining an internationally competitive industrial sector will be crucial.

Changes in the Structure of the Global Economy - These changes not only open up new opportunities, but also provide new competition for the types of products and services that Alberta produces.

The Globalization of Capital Markets - Many of Alberta's future development prospects, including advanced technologies, forestry, petrochemicals and food processing, are capital-intensive and will require new investment from outside the province to reach our full potential.

An Increased Environmental Awareness - More stringent environmental standards, increased global competition and a shift in consumer preferences toward more environmentally friendly products will continue to challenge all Alberta companies to improve both their environmental and corporate performance.

Changing Demographics - Combined with the increasing diversity of labour force participants within the province, the overall structure and fabric of the Alberta workforce is expected to see even more changes in the years ahead.

Three Year Strategy

Working in partnerships with stakeholders and clients the strategies are directed toward:

- analyzing market information and intelligence to improve the business climate, stimulate industry investment in technology development and commercialization and improve the competitiveness of Alberta industry;

- applied research and development aimed at converting knowledge into new or improved products and processes;

- transfer of technology and knowledge into the hands of entrepreneurs and industry;

- technology adoption and adaptation aimed at increasing the utilization of advanced technologies in traditional industries and areas that are of emerging public significance (e.g., the environment, health care).

- state-of-the-art research specialty infrastructure facilities to support and enhance Alberta's industries;

- development, expansion, and attraction of companies that constitute Alberta's technology-intensive industrial clusters:

    - emerging companies -- indigenous Alberta enterprises needing assistance to bring first products to market;

    - threshold companies - those having to expand proven technology capabilities to second generation or diversified products;

    - strategically significant companies -- typically large multinationals whose presence in Alberta would have major positive impact vis-à-vis local suppliers, job creation, local and export markets, research competence, and other spin-off benefits;

- corporate ventures between Alberta firms and national and international companies and institutions where economic growth will result from shared research and development activity, technology exchanges, market collaboration, and increased capital resources;

- strategic alliances and network linkages between industry, universities, and government (i.e. pre-competitive joint research ventures, cooperative projects among the Western provinces, seed funding initiatives, business support networks).

Forest Industry Development

The following priorities have been established, in consultation with the industry, for the next three years:

- applied research and demonstration projects in the application of zero effluent technology, sludge treatment and odour reduction in pulp and paper

- research trials to support the use of CTMP in permanent paper applications

- applied research and development in under-utilized hardwood species and small presently unmerchantable timber to make engineered wood products and medium-density fibreboard(MDF).

- applied research and trials in solid wood and panelboard products (e.g. OSB overlaid with thin MDF)
- applied research into utilisation of sawmill residues as furnish for medium-density fibreboard and particleboard, and pulp sludge for cement-bonded shingles.

Ten Year Directions

Over the next ten years, the major priorities in Forest Industry development will be directed to placing Alberta at the forefront in several areas of forest products R&D:

- Alberta to emerge as the national centre of CTMP R&D in alliance with the Pulp and Paper Research Institute of Canada (PAPRICAN)
- Alberta to establish itself as a centre for engineered wood products research based on composites in partnership with Forintek
- Alberta to be the leading centre for OSB and other panelboard R&D in alliance with the Structural Board Association .

This will be accomplished through leveraging government dollars relative to industry's contribution with the objective of increasing from a 2:3 present ratio to 1:3. The emphasis on developing strategic alliances in forest products R&D will be strengthened. This will allow Alberta to specialise in areas of strength, while drawing support from across Canada and North America to sustain these R&D activities.

9.5.2 Programs, Products and Services

Technology Development Branch

The goals and strategies of the Technology Development Branch are achieved through a portfolio of activities with four thematic components:

1. Formal and Informal Support Programs

   selected examples:
   - Technology Commercialization Program
   - International Technology Transfer Program
   - Conference Grant Program
   - Business Mission Support
   - Information Services
   - Contract Studies
   - Leveraged project funding with Federal departments and agencies

2. Infrastructure Support

   Selected examples:
   - Telecommunications Research Laboratories (TRLabs)
   - Alberta Microelectronic Centre (AMC)
   - The Laser Institute (TLI)
   - Technology Transfer initiatives of U of A and U of C

3. Canada/Alberta/Industry Collaborative Initiatives

   Selected examples:
   - Westaim Initiative in Advanced Materials
   - Canada/Alberta Partnership Agreement in Communication Technology
   - High Performance Computing Centre
   - Networks of Centres of Excellence

4. Science and Technology Awareness and Outreach

Selected examples:
- Science Alberta Foundation
- National Science and Technology Week
- ASTech Foundation

Forest Industry Development

The research and development activities consist of technical assessment services and advice on a consultative basis with industry, and cost shared funding support for projects. These programs and services are provided in three areas:

- Forintek sponsorship provides access to the extensive solid wood products R&D which is undertaken through Canada's wood products laboratory
- Forest Products Market Development: assists industry in obtaining regulatory approvals and standards certification when introducing new products and entering new markets
- Value-Added-Forest Products R&D: assists industry in developing processes and products based on Alberta's unique fibre mix and in supporting technology transfer particularly for smaller mills. Also provides assistance to industry to increase product recovery and value per cubic meter of wood fibre, utilise mill residues and combine wood and non-wood fibre in composites.

9.5.3 Measurable Results

Success in fulfilling this mission will be indicated by an increase in:
- the number of technology-intensive companies in the province;
- the size of such companies in terms of revenue, employment, investment, exports, etc.;
- the aggregate size of these companies relative to the economy as a whole; and
- the utilization of state-of-the-art technologies in traditional economic sectors.

Other more specific measures of success of the research related programs can be measured by:
- the number of new products and technologies developed and commercialized,
- technical knowledge advanced, operating costs reduced, new sales generated, jobs created, investment made or planned and
- reduced environmental impacts.

An annual audit system has been put in place to keep track of the measurable benefits. This system uses evaluation questionnaires which are sent to each project proponent six months after project completion. Information is requested on whether and how the results are being utilized, potential economic benefits and impact on the company's operations. An annual report is prepared to describe R&D projects undertaken over the past year and their corresponding benefits.

Examples from the past year

- the Conference Grant Program providing modest financial support ($5,000 maximum) to staging high profile conferences, seminars and workshops of a technological nature has been successful in leveraging significant financial support for these events from other public and private sources.

- Canadian Environmental Technology Advancement Corporation (CETAC) was incorporated as a not-for-profit entity representing an active partnership of waste generators, environmental technology product developers, business and technical support services, the financial community, the research and development community, and western provincial and federal governments. CETAC commenced

operation in August 1994 and is moving rapidly towards implementation of its business plan objectives.

- the International Technology Transfer Program established to encourage technology transfer on an international level resulted in job creation, revenue generation, new skills, cross licensing and cross distribution of products. In 1994/95, for example a Calgary firm expects to earn an extra $180,000 in revenue over the next three years and will create one marketing and two programming jobs.

- a marketing mentor program, cost-shared by the Alberta government and a test group of 10 Alberta computer technology companies has resulted, over the course of the 12 month period, revenue increases for several companies of as much as 150-250% with staffing increases as much as 50-70%. Estimates of program results indicate that aggregate export revenue increases for the ten companies combined were more than CAN$4 million for the year.

- the Technology Commercialization Program (TCP) was used to support a start-up company, to develop an advanced data compression modem. This product was introduced to markets in Singapore, Malaysia and Hong Kong. The company recently went public on the Alberta Stock Exchange and raised $800,000.

- research trials on various combinations of wood residues and chips to produce MDF has led one company to announce an investment of $35 million to double its capacity and create 31 new jobs. Two other groups are reviewing feasibility studies and are expected to make announcements on new plants in 1995.

- research projects cosponsored with the Alberta Research Council over the past four years have demonstrated that several wood species when mixed with aspen provide excellent furnish for high quality oriented strandboard. The results have been incorporated in the two most recent OSB mills under construction which plan to use 30% balsam poplar. Total investment will be $250 million and 550 new jobs created.

- assisted a pine shake manufacturer to gain market access in the U.S. for pine shakes by undertaking a series of tests required by the American Society of Testing and Materials. Test results have allowed the company to increase its production by 30%, increase raw material utilization by 40%, expand export sales by $1.2 million and create 20 more jobs.

- the application of artificial intelligence in process control for pulp mills (kraft and chemi-thermomechanical pulp). Following the first year of a three year project, one member of the research team has been hired by a pulp mill to implement the first system. The U of A laboratory has earned a membership in the pulp and paper centre of excellence in Canada.

- the successful design and development of a new glulam beam from Alberta 1 x 4 spruce has allowed the company to reduce its wood costs by 10% and displace imported Douglas-fir. Sales are expected to increase by $1 million for the next 3 years.

- an investigation of the feasibility of using trim blocks to manufacture finger-joined lumber for the millwork industry. Based on the results, the company purchased a chop saw and finger-jointer and is now producing and selling finger-joined lumber. Ten new jobs were created.

- utilization and disposal of pulp mill sludge from a bleached chemi-thermomechanical pulp (BCTMP) mill. Field trials on agricultural land have demonstrated both moisture retention benefits and soil nutrient benefits. Farmers around pulp mills will benefit from a lower cost fertilizer and the mill will reduce landfill costs by about $250,000/year.

- a research project by Alberta Research Council, Forintek, and the University of Alberta, sponsored by the department, led to the construction of a wood I-beam plant in Alberta.

- a computerized system to track logging trucks has allowed a kraft pulp mill to rduce its delivered wood costs and improve safety. Plans are to market the system to other mills in Alberta and North America.

9.5.4 Human Resources

The R&D programs don't expect any major changes in staff complement

9.5.5 Implementation Plan

The R&D programs are managed by a small management team within the department. The staff respond to company proposals as well as work with companies to develop proposals that address their research and development needs. The programs continue to focus on applied research - particularly on technologies and products ready for commercialization.

Projects are evaluated on the basis of their merit, particularly their potential benefits to companies, the province, and the size of industry's contribution. Project results are normally made available to the public.

Working with Industry

The Forest Industry Development Branch works closely with industry to determine R&D priorities and ensure that industry is a full partner in the activities that are undertaken. This is accomplished through the use of several criteria:

1. Industry is expected to cost-share R&D activities. The contribution ratio in 1994/95 has averaged 60:40 industry/department contributions and continues to increase in leverage.

2. The results of R&D projects are expected to be available to the Alberta industry. Proprietary R&D is avoided in favour of projects with broad application.

3. R&D projects must have immediate commercial application leading to new investment, new jobs and markets, improved products and processes and improved resource utilization and increased value-added.

Priorities and direction are set and coordinated through the Alberta Forest Research Advisory Council (AFRAC), several strategic alliances and direct industry input. These mechanisms provide a process to plan and jointly fund specific R&D projects. Examples of this process are:

- AFRAC sets R&D priorities for the forest industry in Alberta. The 20 members of AFRAC are drawn from government (federal/Alberta,) Alberta Research Council, FERIC, Forintek, PAPRICAN, Alberta Forest Products Association and industry.

- The Alberta CTMP Consortium, consisting of the department, Alberta Research Council, Alberta Newsprint Co., Slave Lake Paper Ltd., and Millar Western, addresses mechanical pulp and paper R&D requirements.

- the Wood Panel Bureau Alliance addresses market development activities for OSB, particleboard, MDF and hardwood plywood. The association consists of the Structural Board Association, Canadian Particleboard Association, Canadian Hardwood Plywood Association, the federal government, the provinces (Alberta, Ontario, Quebec) and industry.

- the Cooperative Overseas Market Development Program (COMDP) coordinates regulatory and market access initiatives for solid wood products and consists of government (federal/Alberta/B.C.) and industry (AFPA/COFI).

- Forintek as Canada's national wood products laboratory, has 163 members from industry, federal government, the provinces and research agencies. The largest group of members is from Alberta and is represented by the Alberta Forest Products Association. The department and AFPA sit on the board of directors. All members have access to the results from the entire program.

- The Structural Board Alliance sets research priorities for OSB. The alliance is made up of the Structural Board Association, Alberta Research Council, Forintek and the department.

- The Pulp Mill Process Control Partnership focuses on the application of artificial intelligence systems to improve process control in manufacturing pulp. The partnership includes the University of Alberta, industry and the department.

9.5.6 Financial Plan

Tables 9.5.1 and 9.5.2 show the S&T investment projected for the next three years compared to the 1994/95 estimate.

TABLE 9.5.1 ESTIMATED S&T INVESTMENT ($ MILLIONS)

	1994/95	1995/96	1996/97	1997/98
Canada/Alberta Partnership Agreement - Communications Technology	1.70	0.25	-----	-----
Research Infrastructure (TRLabs,Alberta Microelectronic Centre, The Laser Institute	3.20	3.20	3.20	3.20
High Performance Computing Centre	1.40	1.20	1.20	----
Networks of Centres of Excellence	0.04	0.4	0.4	0.4
Technology Commercialization Program	0.70	0.60	0.60	0.60
International Technology Transfer	0.09	0.09	0.09	0.09
Technology Transfer and Prototype Development	0.20	0.20	0.20	0.20
Research Network Development	0.20	0.20	0.20	0.20
Forintek	0.10	0.10	0.10	0.10
Value-Added Forest Products R&D	0.50	0.50	0.50	0.50
Forest Products Market Development	0.20	0.20	0.20	0.20
Business Strategy and Plans	0.25	0.25	0.25	0.25
TOTAL	8.58	7.19	6.94	5.54

TABLE 9.5.2 ESTIMATED S&T INVESTMENT ($ MILLIONS)

	1995/96			
	R&D	RSA	Federal	Industry
Canada/Alberta Partnership Agreement - Communications Technology	$ 0.25	$ --	$ 0.25	$0.25
Research Infrastructure (Telecommunications Research Labs) (Alberta Microelectronic Centre) (The Laser Institute)	3.20	--	0.50	6.0
High Performance Computing Centre	1.20	--	--	2.0
Networks of Centres of Excellence	0.40	--	5.00	--
Technology Commercialization Program	0.60	--	--	2.0
International Technology Transfer	--	0.09	--	0.1
Technology Transfer and Prototype Development	0.2	--	--	0.2
Research Network Development	0.10	0.10	0.2	0.2
Forintek	0.10	--	5.60	2.50
Value-Added Forest Products R&D	0.50	--	--	0.76
Forest Products Market Development	--	0.20	0.35	0.65
Business Strategy and Plans	--	0.25	--	----
Total:	6.55	0.64	5.95	11.45

9.6 ALBERTA ENERGY

9.6.1 Introduction

The Oil Sands and Research Division (OSRD) of Alberta Energy now encompasses the former AOSTRA programs in oil sands, heavy oil, and enhanced recovery of conventional oil together with the coal and hydrogen research programs of the Department. This consolidation brings all of the energy-related technology development under one umbrella and will facilitate the targeting of the research efforts to support the strategic goals of the Ministry.

The Minister of Energy has appointed the Energy Research Council (ERC), a private sector board which will provide advice and direction on research priorities, programs, and expenditures. The research program of the Department of Energy , which is described in this section, will be reviewed and assessed by the ERC and will be updated to reflect their input.

The OSRD research investments are mainly in projects conducted jointly with industry. In 1993-94 for the overall AOSTRA program, funding by industry was 77% with AOSTRA providing the remaining 23%. Thus every dollar invested by AOSTRA was matched by three industry dollars. A similar leverage of investment was also achieved in the remainder of the OSRD program.

9.6.2 Background

The over-all mission of the Department of Energy is to facilitate the orderly development and upgrading of the province's energy and other mineral resources to obtain the optimal economic and social returns for Albertans. This is achieved through expansion of industrial activity while minimizing the environmental impact of resource development and use.

The Department considers that energy research expenditures are an integral part of the array of levers available to promote the development of Alberta energy resources.

The resources under the stewardship of Alberta Energy include remaining established reserves of 420 million cubic metres (2.6 billion barrels) of conventional crude oil at the end of 1993, 747 million cubic metres (4.7 billion barrels) of bitumen from deposits under active development, 1542 billion cubic metres (54.7 trillion cubic feet) of natural gas, and 34 billion tonnes of raw coal. The Department is also responsible for the management of the provincial crown-owned industrial and metallic minerals.

Canada has only 1% of the world's conventional oil. However, in Alberta there are an estimated 2.6 trillion barrels of bitumen in place in the oil sands and carbonate formations. These deposits are of such a scale that Alberta holds over 40% of the reported bitumen in the world. This is a greater volume than the entire Middle East oil reserves.

In 1993, Alberta's energy industry employed approximately 150,000 people, and the extraction and sales of energy resources contributed revenues of $18.8 billion to the Alberta economy and $2.5 billion to the public purse.

If the Alberta energy industry is to continue as the largest single wealth-generating component of the provincial economy, it is essential to continue developing and applying new technologies. These new technologies are required to maintain and improve the production capability and competitive position of the energy industry, and to meet increasingly stringent environmental standards. In particular, the production capability for conventional oil is forecast to decline by 80,000 cubic metres (500,000 barrels) per day by the year 2000. This shortfall will have to be largely made up by increased heavy oil, bitumen and synthetic crude production if Canada is to avoid dependence on imported oil.

Additionally, improved technology is required to upgrade Alberta's energy resources to higher value-added products, and to allow development of resources that have not been fully evaluated or exploited to date. As examples of the latter, the renewable solar and wind energy resources of southern Alberta show promise for large scale use, while substantial amounts of hydrogen are present in the form of hydrogen sulphide in Alberta's sour gas resources. Economical recovery of this hydrogen could contribute significantly toward the increasing amounts of hydrogen required for heavy crude upgrading.

Alberta also has numerous deposits of non energy-related minerals whose commercial significance has not been fully identified or characterized. The development of all these energy and other resources can contribute enormously to the growth and diversification of Alberta's resource industry.

The research activities of the Department and of AOSTRA have made noteworthy contributions to the increased pace and future potential of resource development in Alberta. The cost of this research is only about one-tenth of one percent of the economic returns to the province from resource development. As examples of these contributions, when AOSTRA was established in 1974 technology existed to recover bitumen from the mineable oil sands for a total recoverable reserve of some 27 billion barrels. Today, through AOSTRA's efforts, together with those of the private sector, recovery can be achieved from all three of Alberta's oil sands deposits for a combined producible reserve in excess of 300 billion barrels. In addition, production costs have been reduced to half of their former value or less and are becoming competitive with the cost of producing Alberta conventional crude oil. Industry has used this technology in commercial development from the Peace River and Cold Lake deposits and is actively involved in recent advances in recovery from the Athabasca deposit. Technology has also been advanced for recovery from Alberta's heavy oil deposits and for renewed recovery from abandoned light oil reservoirs. At the Vikor Resources-Joffre project, which has gone commercial, recovery has been increased 50% from a previously abandoned reservoir.

OBJECTIVES OF THE OIL SANDS AND RESEARCH DIVISION

The following are the current research and development objectives of the Division to fulfill the Department's over-all mission of facilitating the production and processing of the province's energy and mineral resources for the optimal economic and social benefit of Albertans:

- confirm the superior performance projected for the twin-well steam assisted gravity drainage process for bitumen recovery, in tests in a commercial scale production pattern with underground access in the Athabasca deposit continuing to the end of 1996;
- extend the concept of the twin-well steam assisted gravity drainage process to wells drilled from the surface, in all three major oil sands deposits;
- demonstrate the AOSTRA-TACIUK Process (ATP) recovery technology in a mined oil sands application;
- develop technology which will substantially reduce the cost of converting raw bitumen to transportation fuels;
- maintain ongoing activities in technology transfer, institutional research, and information dissemination in the oil sands, heavy oil, and enhanced recovery areas;
- develop clean coal-burning technologies to permit the long-term, environmentally acceptable use of coal as the fuel of choice for electricity generation;

- develop technologies for producing, transporting and using hydrogen more efficiently and economically in Alberta for use in upgrading energy resources, production of ammonia and methanol, and new commercial applications;

- maintain support for renewable energy projects to allow an orderly transfer of these activities to the private sector;

- develop and publish basic geological and resource inventory information through the Alberta Geological Survey, to assist industry in exploration and development of the province's petroleum, coal, industrial and metallic mineral resources;

- through a mineral development agreement with the federal government, to improve the quantity and availability of mineral-related geoscience data and to facilitate further development of Alberta's non-energy mineral resources.

OTHER ORGANIZATIONS INVOLVED

Active collaboration with other organizations and particularly with industry, is a very important part of the Division's strategy for technology development and application. Such collaboration provides substantial advantages in establishment of priorities and program orientation, sharing of technical expertise, technology transfer, and cost sharing. Table 9.6.1 shows the types of organizations involved in each of the major program areas.

Underlining the extent of industry participation, over 75 companies are involved in the oil sands, heavy oil and enhanced oil recovery programs as project participants or as licensees of technology. Formal networks are in operation in several areas: a University/Industry Access Program with research projects at 8 Canadian universities and 26 participating companies; the AACI Program of in situ recovery research of the Alberta Research Council supported by 12 companies and CANMET; and the Canadian Oil Sands Network for Research and Development (CONRAD) with 14 industry, university, and government members and an Operating Secretariat provided by the Department. The technical and financial participation of industry are similarly essential aspects of the coal and hydrogen research programs.

9.6.3 Program Elements: Benefits and Impacts

Oil Sands, Heavy Oil and Enhanced Oil Recovery

Institutional

Basic and applied research at universities and research institutions provides the new concepts which will form the basis of future technology development. Emphasis is being given to those programs which have strong industry interest and support, such as the Oil Sands Research Program at the Alberta Research Council, the University-Industry Research Program, the Computer Modeling Group, the Petroleum Recovery Institute, and the Centre for Frontier Engineering Research. Support will continue to be given to the Strategic Research Program at the ARC which is designed to move technology forward from research to field application.

Technology Handling

An important aspect of OSRD's technology development mandate is to make relevant information in the public domain from all parts of the world readily available to users, and to make technology developed in partnership with industry available at fair market value. A related role is to serve as a channel of communication with other agencies and the private sector for information and technical assistance which cannot be supplied directly by OSRD.

TABLE 9.6.1 PRINCIPAL ORGANIZATIONS INVOLVED

Organization	Oil Sands and Heavy Oil	Enhanced Oil Recovery	Coal Technology	Hydrogen Research	Renewable Energy	Mineral Development
Alberta Chamber of Resources	x		x	x		x
Alberta Geological Survey	x	x	x			x
Alberta Research Council	x	x	x	x		x
Alberta Utilities & Energy Board	x					x
Canada Centre for Mineral and Energy Technology (CANMET)	x	x	x	x		
Canadian Electrical Association			x			
Canadian Oil Sands Network for Research & Development (CONRAD)	x			x		
Centre for Frontier Engineering Research (CFER)	x	x		x		
Companies and Government Agencies in Other Countries	x	x	x			
Computer Modeling Group	x	x				
Environment Canada	x	x	x	x		
Geological Survey of Canada			x			x
Hydrogen Industry Council	x			x		
Industries	x	x	x	x	x	x
International Energy Agency		x	x			
National Energy Board	x		x			
National Research Council	x					
Natural Resources Canada			x	x	x	x
Petroleum Recovery Institute	x	x				
Saskatchewan Research Council	x	x				
The Coal Association of Canada	x		x			
United Nations Institute for Training and Research (UNITAR)	x	x				
Universities	x	x	x	x	x	x
Wastewater Technology Centre	x					
Western Economic Diversification	x		x	x	x	x

This "one window" availability of information and technology has proven very useful to industry in the development of the resource, and has been a significant factor in establishing productive linkages with industry and researchers.

Mining and Extraction

Support will continue on the application of the AOSTRA-TACIUK Process and other processes which reduce tailings problems and/or lead to significant cost reductions in producing bitumen from mined oil sands. Industry is involved as consultative participants in the demonstration tests of the 5 tonne per hour ATP for oil sands processing, and in the associated engineering and cost studies. A mineable oil sands lease north of Fort McMurray has been assigned as a site for a prototype-scale demonstration in partnership with industry if favourable economics are confirmed in the current program. Further attention will be given to the use of hydraulic mining and ore transport in conjunction with new extraction processes as a means of reducing overall costs. Planning is proceeding toward demonstration of one or more alternate extraction technologies.

Technology Transfer and Commercialization

The principal thrust in this area will be in commercializing Steam-Assisted Gravity Drainage Process as developed in the Underground Test Facility and the AOSTRA-TACIUK Process (ATP) for oil sands, oil shales, and for cleanup of contaminated soils. These technologies have shown excellent commercial potential and will be supported, both as a means of seeing early commercial projects in the province and to facilitate the sale of Alberta technology, products and services. Modest funds will also be expended in promoting other technologies such as Anti-Water Coning Technology (AWACT).

In Situ Oil Sands

The success of the Steam-Assisted Gravity Drainage (SAGD) Technology with the resulting sharp reductions in production costs, excellent recoveries and increased areas opened up for exploitation has prompted interest in application of this technology to deposits other than Athabasca and of its use from surface wells. OSRD is participating in a pilot operation involving two pairs of twin wells drilled from the surface in the Peace River deposit, and will pursue opportunities in the Athabasca and Cold Lake areas, in the Grosmont Carbonate deposit, and in the heavy oil areas. Other expenditures would be in engineering support for all developments.

> The pre-commercial scale project operated, up to now, by AOSTRA with nine industry participants for production of bitumen from the Athabasca oil sands by the twin-well Steam Assisted Gravity Drainage (SAGD) Process has reached its designed capacity of 2000 barrels per day. Business arrangements are being pursued for an industry Operator to replace AOSTRA, and it is expected that a private company will lead the project through to commercialization.
>
> The SAGD technology developed at the Underground Test Facility is being applied in the Peace River oil sands deposit by Shell Canada Resources Ltd. using two pairs of 1000-m horizontal wells drilled from the surface. While experimental, the horizontal wells are being tied into the existing commercial project and their projected production of 1000 - 1200 barrels per day will add 10% or more to the total production of the project.

Heavy Oil

Proposed research will be directed toward continued support of the use of steam, combustion and immiscible carbon dioxide ($C0_2$) recovery as means of improved recovery of heavy oil. Increased use of recovery processes using horizontal wells will also be supported.

> Successful tests of the combination cyclic steam/steamflood heavy oil process developed with Norcen Energy Resources Limited and three other industrial partners have been completed in the

Bodo field with recovery of approximately 55% of the original oil in place from the enclosed central area of the pilot. Commercial use of the process will be contingent upon expectations of higher prices for heavy oil.

An innovative project to improve well productivity and recovery using electromagnetic energy to heat the heavy oil in situ is being conducted with Texaco Canada Petroleum Inc. at Frog Lake, using three slant wells and a 500-meter horizontal well. All four wells are currently being produced on primary recovery to establish baseline data.

Enhanced Recovery of Conventional Oil

Support will continue for $C0_2$ miscible recovery projects and for further testing of the anti-water coning technology. The main strategic thrust, however, will be in the use of horizontal wells to greatly increase recovery from our depleted conventional reservoirs. Some funds will also be expended on basic research and engineering studies.

The ability of a carbon dioxide miscible flood to recover as much as 50 percent additional oil from the previously water flooded and abandoned Joffre Vikor pool was demonstrated in a pilot project with Vikor Resources and other unit participants. The project was converted to a commercial operation at the end of 1990 and is being expanded in stages to cover the whole unit. Oil production (all of which is incremental) has reached 1.8 million barrels to date.

The Anti-Water Coning Technology (AWACT) for suppression of water coning into production wells is the first new enhanced recovery method to be commercialized on a field-wide basis in the past 20 years. Alberta Energy Company and Westcoast Petroleum are using AWACT in 35 wells in the Suffield South Jenner field with 630,000 barrels of incremental oil produced to date, and are planning to extend treatment to 300 wells. The technology is now under test in several other fields and has been licensed to service companies that provide commercial AWACT treatments on a "turn-key" basis in Alberta, Canada, United States, and Mexico.

A 1142-m long horizontal well project with Beau Canada Exploration Ltd., is producing oil at a rate of 4 m^3/d from the Rundle formation, a low permeability reservoir where vertical wells typically have poor productivity.

The caustic polymer flood project with Crestar Energy in the Cessford area is performing in excess of projections.

Environmental Projects

Environmental projects will concentrate on water treatment projects to permit and improve water recycle in in-situ recovery projects, on research into reducing tailings ponds at oil sands plants, and on $C0_2$ removal and disposal.

9.6.4 Measurable Results

Expected Impacts

The petroleum industry directly and indirectly generates a large proportion of the total economic activity in Alberta, and represents one of this province's principal strengths relative to other parts of Canada. However, its continued development will depend on the availability of advanced technology for the economical development of oil sands and heavy oil and for enhanced recovery of conventional oil, to offset the declining production from existing fields. Finding costs for conventional oil are increasing in Alberta, and it is expected with improved economics that oil sands, heavy oil and enhanced recovery will

become the most attractive sources of new production within 10 years. An equally important goal will be to maintain the profitability of Alberta production during a period of low world oil prices.

The following are some of the expected impacts of the programs described above:

1) Revitalized commercial development of Alberta's oil sands by reducing production and conversion costs below the price envelope expected for the products. This will be achieved by:

   - confirming and demonstrating production costs of $7/barrel;
   - lowering of upgrading costs by $4/barrel; and
   - increasing the market value of the Synthetic Crude Oil produced.

2) Expanded use of horizontal wells, carbon dioxide, and other enhanced recovery techniques to prolong conventional oil production.

3) Maintenance of a strong scientific and technological base on which commercial development of Alberta's oil sands, heavy oil, and enhanced recovery resources can proceed.

4) A lower cost and expanded recoverable resource base.

Coal Technology

The goal of the coal technology research program is:

- To ensure the long term sustainable development of Alberta's vast coal resource by a diversified coal industry, the use of coal as a major source for electric power generation, and feedstock for value-added products, and the competitiveness of Alberta coals in national and international markets.

In addition, industry expects that the Alberta Coal Research Program provides coordination between Canadian government and private sector coal R&D efforts to avoid duplication, improve overall effectiveness of research and where possible pool research funds.

The program objectives are:

- To minimize the environmental impact of coal production and use in Alberta and elsewhere.
- To enhance the competitiveness of Alberta coals in domestic and international markets.
- To examine the technical feasibility and general economic viability of potential uses for Alberta coals.

The Program's short term priority and focus is on:

- Emissions from coal production, handling and use. The special interests of the utility companies are the reduction of particulates, SO_x, NO_x, any potential toxic elements and solid and liquid waste streams.

The Program's Medium Term Priority is:

- Coal production technologies and new use opportunities, which promise cost effective operating improvements and/or emission reductions.

Research activities in these priority areas will assist the existing and well-established Coal Industry to continue and possibly expand, while demonstrating that coal can be as environmentally acceptable as any other fossil fuel.

The Coal Research Program will be maintained by the Department at a $600,000/year funding level for the next three years.

Hydrogen Technology

The goal of the hydrogen research program is:

- To make the energy industry more competitive by developing technologies to produce, distribute and use hydrogen more efficiently and at less cost.

The program objectives are to:

- Increase the competitiveness of Alberta's industry by lowering the cost of hydrogen through new or more efficient hydrogen generation, transportation and use.

- Promote the expansion of Alberta's petroleum industry by developing hydrogen technologies to increase the hydrogen-to-carbon ratio of Alberta's fossil fuels and meet present and future environmental requirements.

- Diversify Alberta's economy by developing new commercial use of hydrogen which will build on Alberta's resource industry and broaden the provincial industrial base.

The Alberta Hydrogen Research Program supports technology developments which are environmentally sound and which promise profitable applications in Alberta's industry. The program focuses on the following priority areas:

Hydrogen Production

- New, improved methods
- High-temperature hydrogen separation

Hydrogen Collection/Transportation/Distribution

- Hydrogen storage
- Materials
- Low-temperature hydrogen separation
- Surplus hydrogen collection and re-use

Hydrogen Utilization/Optimization

- Optimization of present uses of hydrogen
- New commercial uses of hydrogen

The program's short term focus is on:

- Practical and results-oriented research rather than more fundamental long-term research.

The Department is committed to support the Hydrogen Research Program at a $1M/year funding level for the next three years.

Alberta Geological Survey

The Alberta Geological Survey is the custodian of mineral assessments and cores from mineral drilling in the province. The Survey plays a significant role in increasing the knowledge and awareness of the potential for industrial and metallic mineral development, and is developing a comprehensive information system.

Alberta's economy is greatly dependent on the earth's resources. Geoscience information is the key to exploration and development decision-making, environmental protection, and ensuring that the optimum benefits accrue to the province from its mineral resources.

The principal functions of the Alberta Geological Survey (AGS) are:

1) To describe the geological framework of Alberta through mapping, modeling and analyses of raw data;
2) Conduct resource inventory and characterization through collection and synthesis of data; and
3) To manage archival geological data.

In addition, the AGS provides geoscience information services to the public. The information provided by the AGS to the various levels of government, industry and the general public allows the government to make informed resource policy decisions and encourage industry to focus appropriately on exploration and development.

The Alberta Geological Survey is currently operated by the Alberta Research Council under joint management with OSRD. Negotiations are currently underway to transfer the operation of AGS to OSRD to further improve integration with the mission of the Department.

Southwest Alberta Renewable Energy Initiative

A $3 million, four-year support program for the development and demonstration of renewable energy technologies through the Southwest Alberta Renewable Energy Initiative was completed by the end of the fiscal year 1993/94. The program successfully implemented a series of solar and wind energy projects in southwest Alberta. For example, a significant, multi-turbine (20 MW) wind farm has been constructed near Pincher Creek and is now in operation.

The Department of Energy is continuing modest financial support over the next 2 years for a Renewable Energy Information Centre in Pincher Creek, a small test site near Pincher Creek, and a project to monitor several of the wind energy projects in the program. This will allow an orderly transition of these activities to the private sector.

Canada-Alberta Partnership on Minerals

More than 40 industrial minerals are believed to be present in Alberta, but 98 percent of the value of Alberta's mineral production comes from only five minerals: sulphur, sand and gravel, gypsum, lime and salt. Together, these commodities contribute approximately $260 million to Alberta's economy each year.

The objectives of the four-year Partnership on Minerals program funded jointly by the federal and Alberta governments are to:

further develop Alberta's metallic and industrial minerals industries;

increase the productivity of these industries;

improve the quantity and availability of mineral-related geoscience data; and

replace imported minerals with locally mined minerals where possible.

This mineral development program aims to produce detailed regional maps and commodity profiles, and will undertake geological exploration to identify new metallic and industrial mineral deposits. The program will also develop recovery, extraction and processing technologies for existing and new operations as well as identify the significant economic factors for mineral development to proceed. Associated with this activity is the continuation of the current Alberta Geological Survey program in petroleum geology, basin analysis, coal geology and oil sands geology.

The Partnership on Minerals has improved the understanding of the geologic environment in Alberta, and has identified potential exploration targets on which the industry has already begun to act. This, in combination with the investigation of mineral-related technologies, should open new opportunities for Alberta's mineral industries and help make Alberta and Canada more self-sufficient in these resources.

To date, 34 geoscience, ten technology development and nine economic development projects have been initiated. Reports from the geoscience and economic development projects are available to the public through the Institute of Sedimentary and Petroleum Geology (ISPG) in Calgary, and the Alberta Research Council Publications Office in Edmonton. Reports from the technology development projects will be released at the conclusion of their respective confidentiality periods.

Significant developments in the Alberta minerals scene as a result of the Partnership on Minerals include the continuing industry interest in diamond exploration, additional study of the potential for recovery of metallic minerals from Alberta's oil sands resources, and the discovery of gold in carbonates in northeastern Alberta.

The current Canada-Alberta Partnership on Minerals will be completed and terminate on March 31, 1996.

9.6.7 Proposed Investment Level

The proposed investment levels for 1995/96, 1996/97 and 1997/98 for the research and development activities of the Division are shown in Table 9.6.2, together with the current fiscal year budget.

It should be noted that the research and development investments of the Alberta government in these areas are currently leveraged by a factor of more than 3 to 1 by the expenditures of industry, the federal government, and other agencies.

TABLE 9.6.2 ALBERTA DEPARTMENT OF ENERGY OIL SANDS AND RESEARCH DIVISION - PROPOSED INVESTMENT LEVELS (MILLIONS OF DOLLARS)

	1994/95		1995/96		1996/97		1997/98	
	RSA	R&D	RSA	R&D	RSA	R&D	RSA	R&D
Oil Sands, Heavy Oil and Enhanced Oil Recovery[1]	1.16	13.03	1.13	12.17	1.13	12.17	1.13	12.17
Coal and Hydrogen[2]	0.59	1.60	0.59	1.60	0.59	1.60	0.59	1.60
Geological Survey[5]	--	1.37	--	3.17	--	3.17	--	3.17
Alternate Energy[3]	--	0.18	--	0.11	--	0.13	--	--
Mineral Development Agreements[4]	--	1.0	--	0.40	--	--	--	--
TOTAL	$1.75	$17.18	$1.72	$17.45	$1.72	$17.07	$1.72	$16.94

1. Combines activities of former AOSTRA, AOSE (Research Activities) and Research Activities of Alberta Department of Energy;

2. Combines Activities of former Research and Technology Branch and Office of Coal Research and Technology;

3. SWAREI (South West Alberta Renewable Energy Initiatives)

4. Funds are provided through Economic Development and Tourism and administered by OSRD.

5. OSRD will administer and fund the Geologic Survey from 1995/96 onward. It was previously jointly funded with the Alberta Research Council.

9.7 Alberta Environmental Protection

9.7.1 Executive Summary

Applied research and technology development activities are essential to Alberta Environmental Protection in carrying out its environmental protection, enhancement and resource management mandate. The Department is dedicated to continuing scientific and technical leadership in research, technologies and environmental standards. The Alberta Environmental Centre, a division of Corporate Management Service, plays a major role in delivering the defined priorities in research and technology development for the Department. Efficiencies will be achieved through setting departmental priorities and performance evaluation aimed at the timely delivery of relevant R&D products to customers.

The financial plans focus on a controlled reduction in public R&D funding. However, departmental strategies such as "outsource, privatize and partnership where possible", will be instrumental in providing the balance of required funding to maintain leading edge research and technology development for the Department.

9.7.2 Foundation

Environmental protection and responsible management of the province's natural resources are critical in maintaining Albertan's quality of life and in supporting the province's economic development strategy. Research, technology development and related scientific activities are essential to Alberta Environmental Protection in carrying out its protection and resource management mandate.

Alberta Environmental Protection is a department in transition. It has focused on consolidating and integrating the former departments of Forestry, Lands and Wildlife, Environment and the Parks component of Tourism, Parks and Recreation to enhance its service delivery. The Department has developed a vision, a mission statement and a set of operating principles and a new organizational structure, and is implementing a number of organizational changes in response to the Government's direction to adopt a new way of doing business.

A key part of the new organization is Corporate Management Service, which has the responsibility of planning, prioritizing and integrating research needs across the Department, and conducting interdisciplinary applied research for the Department.

The Alberta Environmental Centre (AEC), the provincial environmental applied research and laboratory services organization, which serves Environmental Protection, Agriculture, Food and Rural Development, Health and several other departments and agencies of government, now reports to the Assistant Deputy Minister of Corporate Management Service. Alberta Special Waste Management Corporation is the other organization, which also undertake research and related scientific activities.

Alberta Environmental Protection has prepared a rolling three-year business plan. Research, technology development, and related scientific activities, key component of the Department's core businesses, are being redefined and streamlined to ensure they support the Department's core businesses.

Mission

"As proud stewards of Alberta's renewable natural resources, we will protect, enhance and ensure the wise use of our environment. We are a dedicated and committed team, responsible for managing those resources with Albertans. We are guided by a shared commitment to the environment and are accountable to our partners, the people of Alberta."

Goals

The goals describe the key results desired for Environmental Protection's Business Plan:

- Contribute to building a strong, sustainable and prosperous province by ensuring that:
  Alberta's renewable natural resources (air, land, water, forests, fish and wildlife, and parks and natural reserves) are sustained; and
  high environmental quality is maintained.

- Deliver the Ministry's core businesses more efficiently and effectively, thereby contributing to the Government's deficit reduction targets.

- Integrate and consolidate the Ministry's services, and improve customer service.

- Deregulate and streamline regulatory processes, and harmonize federal and provincial environmental legislation and programs.

- Improve the Ministry's legislative framework through continued updating and streamlining, and ensure that Albertans are well informed and involved in the decision-making process.

- Implement business changes through innovation, fairness and wise investment in human resources.

Key Success Factors (Operating Principles)

Alberta Environmental Protection has identified those factors which will enable the Department to fulfill its mission and meet its goals:

- Scientific and Technical Leadership
  Albertans will continue to show international scientific and technical leadership in research, technologies and environmental standards.

- Sustainable Development
  Albertans are dedicated to achieving sustainable development that ensures the utilization of resources and the environment today does not impair prospects for their use by future generations.

- Ecosystem Sustainability
  Alberta's ecosystems will be sustained through integrated resource planning, allocation, management and decision making.

- Shared Responsibility
  All Albertans are responsible for ensuring the protection, improvement and wise use of our environment through their actions.

- Anticipation, Prevention and Mitigation
  Albertans are committed to protecting our environment by anticipating, preventing or mitigating environmental impacts of policies, programs, decisions and development activities.

- Public Involvement
  Albertans will have every opportunity to understand and provide advice on decisions affecting our environment.

- Intergovernmental Cooperation
  Albertans will work cooperatively with other governments to achieve wherever possible to improve the quality of life now and in the future.

- Customer Service
  Albertans trust in our stewardship of their renewable natural resources will be met with dedication, commitment, pride and excellence in service.

- Environmental Enhancement
  Albertans are committed to the enhancement of our environment wherever possible to improve the quality of life now and in the future.

- Enforcement
  Albertans' expectations for environmental protection and enforcement are ensured by firmly and fairly enforcing our regulatory framework.

- Preserving and Protecting Special Places
  Albertans are committed to preserving and protecting special places that have historical, cultural and ecological significance.

Strategies

Strategies are the specific steps required to achieve the Department's six goals for the period of three years - 1995/96 to 1997/98.

Goal 1 Contribute to building a strong, sustainable and prosperous province by ensuring that:

- ***Alberta's renewable natural resources (air, land, water, forests, fish and wildlife, and parks and natural reserves) are sustained; and***
- ***high environmental quality is maintained.***

Strategies

Environmental Quality

- Continue to develop environmental quality objectives and standards in cooperation with industry and the public.
- Conduct environmental assessment of proposed developments through an open and coordinated process.
- Regulate industrial and municipal activities to minimize the contamination of soil, air, and surface and ground water.
- Ensure that lands affected by specified industrial activities are returned to an equivalent land capability through conservation and reclamation.
- Provide firm but fair enforcement of legislation in a timely and consistent manner.
- Minimize waste going for disposal by encouraging better recycling and providing technical advice to agencies that have responsibility for management of municipal landfills.

Sustainable Water Supply

- Maintain and improve an information system that documents the availability and use of water throughout the province.
- Provide effective water management through well-planned and timely licensed allocations to enable Albertans to make business decisions regarding the use of water.

- Operate and maintain the province's water management infrastructure to ensure that maximum benefits accrue to all water users.
- Monitor and assess water quality to ensure clean water supplies and healthy aquatic ecosystems through a consolidated water quantity/quality monitoring system.
- Improve water conservation guidelines and promote the conservation of Alberta's water resources.
- Improve guidelines to minimize the impact of instream activities and protect aquatic habitats.
- Effectively manage water to meet our obligations to other jurisdictions.

Fish and Wildlife Sustainability

- Sustain fish and wildlife populations and their habitats
- Provide hunting, fishing and other recreational opportunities for Albertans.
- Contribute to local and provincial economies by providing commercial fish and wildlife opportunities.
- Ensure community support of fish and wildlife resources and associated activities through partnerships, education, enforcement, prevention and intervention.

Forest and Land Sustainability

- Ensure Alberta's forested lands are managed sustainable by:
  - ensuring that harvest levels are within the annual allowable cut;
  - reforesting to provincial standards the annual area harvested;
  - maintaining annual losses resulting from fire, insects and disease to la level at or below 38,522 hectares (i.e., 1/10 of 1% of total area under protection); and
  - maintaining grazing lands under disposition in good condition or better.

Parks

- Ensure that Alberta's natural regions are adequately represented in a Parks System Plan.
- Increase partnerships with the private sector and volunteers to promote and ensure the delivery of recreation and conversation services.
- Increase opportunities for Heritage Appreciation.
  - continue and improve public information, environmental education and interpretation
  - increase the number of natural heritage appreciation programs
- Support growth in tourism and the associated diversification of the Alberta economy.

Goal 2 Deliver the Ministry's core business more efficiently and effectively, thereby contributing to the Government's deficit reduction targets.

Strategies

- Reduce costs, achieve efficiency gains and reduce capital and grant spending through eliminations, streamlining or reductions in programs and manpower.

- project and program completions, reductions and eliminations
  - completion of the Northern Rivers Basin Study
  - offering underutilized provincial recreation areas to local authorities and service groups
  - reduction in Federal/Provincial flood damage reduction program
  - completion of the Help Eliminate Landfill Pollution program
  - elimination of the staff housing subsidy
  - decrease requirement for forest insect and disease control

- efficiencies and staff/program reductions
  - reductions of 123 FTEs in 95/96 and 87 FTEs in 96/97
  - consolidation and downsizing of departmental planning functions

- capital and grant reductions
  - decrease in Water Resource Management capital works projects
  - decrease in Waste Management Assistance Program
  - decrease in Resource Recovery Grant Program
  - end funding of Water Management Systems Improvement Program (95/96)
  - decrease grant to Special Waste Management Corporation

- privatization, outsourcing and partnerships
  - continue to identify opportunities for privatizing, outsourcing and partnerships
  - transfer responsibility for tree seed and seedlings to the forest industry
  - establish greater partnerships with industry in education, inventory, planning, research, protection and operations
  - privatize routine analytical services at Alberta Environmental Centre (AEC)
  - privatize the Emerald Awards
  - privatize the Environmental Views

- Introduce user pay fees and charges for services provided by the Ministry.
  - Alberta Environmental Centre service fees
  - licence and approval fees for Regulatory Services
  - Parks firewood fees - dedicated revenues
  - introduce revolving fund budgeting at the training centre in Hinton

- Increase royalty or economic rent payments for the right to use renewable natural resources.
  - hunting and fishing licence fees
  - water hydro power rental fees
  - water licence and permit application fees
  - Mineral Surface Lease fees
  - deciduous timber stumpage fees
  - Parks and land use disposition fees

Goal 3 Integrate and consolidate the Ministry's services, and improve customer service.

Strategies

- Continue to streamline and integrate services.
- Consolidate Environmental Protection facilities.
- Consolidate laboratory operations.
- Integrate enforcement activities within the Department.
- Implement the Regulatory Approvals Centre to provide easy public access.
- Review and consolidate resource protection and recreation services, where appropriate.
- Integrate Natural Resources Information Systems within the department.
- Consolidate the delivery of outdoor recreation opportunities to provide quality services at locations with high resource, user and economic benefits.
- Design and deliver an orientation program to ensure all staff are familiar with department programs and services.

- Continue to deliver training to empower and enable individuals and work units to achieve excellence in customer service.
- Continue to work in cooperation with other departments.

Goal 4 Deregulate and streamline regulatory processes, and harmonize federal and provincial legislation and programs.

Strategies

- Restructure the regulatory process by:
  - implementing the Deregulation Action Plan and encouraging industry self-regulation,
  - eliminating overlaps in federal/provincial regulations, and
  - introducing economic instruments
- Continue leadership in negotiating and signing federal/provincial agreements that rationalize federal and provincial roles and responsibilities.

Goal 5 Improve the Ministry's legislative framework through continued updating and streamlining, and ensure Albertans are well informed and involved in the decision-making process.

Strategies

- Ensure environmental and resource management policies are more efficiently integrated to satisfy the principles of sustainable development. Policy initiatives include:

  - Natural Resource Management and Conservation Policy Framework,
  - Forest Conservation Strategy,
  - Water Management Policy and Legislative Review,
  - Special Places 2000,
  - Wetlands Policy for Alberta, and
  - consolidating and streamlining legislation and policies for conservation of fish and wildlife resources consistent with the department's deregulation philosophy.

- Continue to consult the public, disseminate information and make environmental decision-making processes more accessible to the public through:

  - public consultation processes,
  - environmental planning, and
  - State of the Environment Report.

- Encourage the participation of aboriginal Albertans in natural resource management.

Goal 6 Implement business changes through innovation, fairness and wise investment in human resources.

Strategies

- Ensure staff are recognized and rewarded for superior performance.
- Consult with staff regularly to achieve effective internal departmental communications.
- Appropriately empower staff and encourage continuous learning.
- Implement a Human Resources Plan that supports the goals of the Business Plan.
- Enhance the programs at the training centre in Hinton to complement the department's Business Plan.

9.7.3 Programs, Products and Services

Corporate Management Service

Alberta Environmental Centre

The Centre is the Department of Environmental Protection's institution of environmental applied research and laboratory services. The Centre was established in 1976 with a mandate "... to provide, in cooperation with other agencies, a comprehensive program of environmental protection, rehabilitation, control and management through research, development, diagnostic and analytical services to agencies of government, industry and the people of Alberta." (RFD K3/76)

Over the period this mandate has been extended by the Department's increasing needs for expert advice, and high quality and specialized analytical services and has recently been translated into the following scientific and technical missions:

- To provide, for agencies of government, industry and the people of Alberta, collaborative applied research, analytical service and technical development projects directed at:
- Developing quality assurance/quality control (QA/QC) procedures;
- Characterizing pollution and waste management problems;
- Characterizing and measuring trace components of environmental samples;
- Characterizing the impact of pests and pest management practices on the environment and developing safe and economically acceptable pest management practices;
- Characterizing the effects and assessing the risks of chemical and physical environmental changes on animals, including man;
- Characterizing and developing means of protecting ecosystems and restoring disturbed, degraded and contaminated habitats.

These missions are executed through the six research and technology development programs at the Centre.

Quality Improvement Services

Mission: To develop and implement a quality assurance/quality control (QA/QC) program for Alberta Environmental Protection services that ensures a consistently high standard of performance.

This mission includes the integration of existing AEC internal quality assurance programs and the development of QA/QC procedures to assure the quality of analytical information provided to AEP by municipal, industrial and private sector laboratories.

QA/QC Documentation

Activities

- Identify and facilitate the accumulation of comprehensive documentation such as standard operating procedures, good laboratory practices, analytical methodologies and QA/QC records.

Expected Impacts

- Ultimately a primary goal will be to achieve International Organization for Standardization (ISO) certification of AEC documentation procedures and associated inventory of record information.

Performance Evaluation

Activities

- Evaluate for Alberta Environmental Protection, the quality of environmental data produced at the AEC and monitoring information supplied by municipal, industrial and contracted private sector laboratories using existing national and provincial performance evaluation round-robin studies.
- Appraise the performance of laboratories submitting analytical information to AEP under AEPEA regulations.

Expected Impacts

- The quality data and analytical information received by AEP will ensure that the decisions are based upon reliable information. Monitoring programs can be efficiently designed to include essential quality control samples which will provide precision and accuracy estimates.

Air, Water and Waste Management

Mission: To provide collaborative applied research for identifying and characterizing pollution and waste management problems, and for recommending solutions.

This mission includes characterization of source emissions and discharges, and assessment and development of technologies for air and water pollution, waste management and contaminated soil remediation. The scope encompasses biological and physical/chemical processes at laboratory, bench and pilot scales. Microbiological analyses and Microtox® toxicity testing are also provided.

Activities

- The use of "biofilters" for air pollution control has been investigated at laboratory and pilot scales and shown to be promising for reduced sulphur and selected organic compounds. An on-site, demonstration unit at a Kraft pulp mill is being commissioned, and a similar unit is being constructed at another mill. Optimisation in design and operation are also being investigated.
- Microbiological identification, enumeration and toxicity tests on process streams and environmental samples are provided to support research and monitoring initiatives.
- Plans have been drawn up to survey emissions of chlorinated dioxins and furans from hospital waste incinerators. Pilot-scale tests are in progress to study formation mechanisms and control, and to evaluate the use of on-line monitoring to indicate the conditions under which these compounds are formed.
- Sampling and analytical methods have been developed and are used in a survey to assess the potential formation of disinfection by-products (DBPs) in three municipalities along the Athabasca River.
- Plans have been drawn up and test units are being developed to evaluate treatment options for indoor fish culturing which employs water recycling.
- The Departmental needs in site remediation research are being evaluated. Assessment of the use of white rot fungi to degrade polyaromatic hydrocarbons is in progress.

Expected Impacts

- Cost-effective and environmentally sound technologies for air pollution control will encourage implementation and air quality will be improved.
- Biological parameters are taken into account in problem definition and process evaluation.
- Concerns with chlorinated dioxins and furans will be addressed by having sound information on status and means of minimizing their emissions.
- Potential for formation of DBPs in drinking waters will be assessed and if necessary means of control can be recommended.
- Support will be provided to a growing industry to use economically and environmentally sound practices.
- The issues related to remediation of contaminated sites can be addressed proactively.

Environmental Chemistry

Mission: To provide collaborative applied research, analytical service and technical development projects to characterize and measure inorganic and organic components of environmental samples.

This mission includes organic and inorganic analytical research and services of ambient and point source samples in most environmental matrices. Method development for organic and inorganic contaminants in new matrices and research into environmental fate and effects of contaminant chemicals are included in this mission.

Organic and Inorganic Contaminant Services

Activities

- Continue to support customers (primarily Alberta Environmental Protection) in their regulatory, monitoring and environmental emergency roles.
- Continue to provide consultation and advice on sampling and analysis of inorganics and organics, and related technical issues.

Expected Impacts

- Contribute to the continued good health of Albertans through regular and systematic analysis of drinking water and air throughout the entire province.
- Ensure that environmental and public health legislation is enforceable through defensible analytical methodology.

Pulp and Paper Related Chemicals

Activities

- Develop and test methods to measure chemicals in pulp and paper mill effluents.
- Investigate the nature and composition of these effluents.

Expected Impacts

- Understand the environmental fate and effect of pulp and paper mill effluents on the rivers of northern Alberta.

- Provide information on biodegradability of effluents, to assist modellers who are evaluating the effect of effluents on dissolved oxygen content of the receiving waters.

Heavy Metals

Activities

- Develop and apply techniques to identify and quantitative heavy metals in complex environmental matrices such as fly ash, dust, industrial sludges and solid wastes, biota, soils and sediments.

Expected Impact

- Solve problems relating to the origin and disposition of heavy metals in the environment.
- Assist regulators in establishing viable standards for these compounds.
- Determine mercury levels in fish to ensure their safe consumption.

Environmental Isotopes

Activities

- Continue to work on environmental, general earth sciences or other problems requiring geochemical isotopic techniques.
- Maintain effective C-14 and H-3 analytical capability as principal research tools.
- Utilize stable isotopes analyses for research projects.

Expected Impacts

- Investigate and solve problems relating to origins and solutions to soil salinity, aquifer characterization, sulfur sources in acid deposition, erosion rates, and river basin source water.
- Assist in preserving our heritage by analysis of archaeological specimens such as found at the Old Man River Dam Reservoir, and the Head-Smashed-In Buffalo Jump.

Pest Management

Mission: To provide collaborative applied research, diagnostic service and technical development projects to characterize the impact of pests and pest management practices on the environment and to develop safe and economically acceptable pest management practices

This mission includes the diagnostic, advisory and field investigation services for problems relating to pest (insect, plant diseases and weeds) management practices. Field and controlled-environment research projects designed to reduce the use of pesticides, and their environmental impact, by using biocontrol agents and alternate cultural practices are also included.

Activities

- Diagnostic and advisory services are provided in insect pests, plant diseases, weeds, and chemical damage to crops and other vegetation to the staff of government departments to assist them in the enforcement of Alberta Environmental Enhancement Protection Act, Agriculture Pest Act and Weed Control Act. The chemical damage diagnostic service provided by AEC is the only one in western Canada.

- Research in the area of weed management has focuses on weed ecology with emphasis on developing mathematical models for estimating crop yield loss due to weeds; control of annual and perennial weeds in conservation tillage systems; herbicide resistance in wild oat populations; and impact of herbicides on weeds, crops and in the environment.
- Research focuses on the biological control of weeds with arthropods and plant pathogens that are natural enemies of the target weeds in environmentally sensitive areas, rangelands and conventional and conservation crop production systems. Several insects are tested and released on Canada thistle, toadflax, field milkweed and leafy spurge. Results have been very promising in these areas, for example, a root-feeding beetle is well established on hundreds of sites in Alberta to control leafy spurge. Fungal pathogens show promise for control of stinkweed, Canada thistle and milkweed.
- Research on insect pest management in field crops, greenhouses and interior plantscapes is continuing with a view to establishing integrated management strategies. For example, several cultural practices have been developed which are effective in reducing yield losses from root maggots in canola. New strains of the biological insecticide, Bacillus thuringiensis, and an exotic parasitic wasp are being tested for control of bertha armyworm in canola. Extensive research on biological control using predators and parasites of greenhouse insect pests such as whitefly, western flower thrips and spider mite, have lead to reduced reliance on chemical pesticides for their control.
- Research on disease management has focused on developing economical and environmentally acceptable control measures by integrating cultural, biological and chemical methods. Research is continuing on blackleg and seedling blight of canola, and rust diseases of wheat snow mould in alfalfa, sainfoin and forage grasses, and Fusarium root rot of field peas and lentils. Research was also initiated on diseases of tree seedlings and turf grasses.

Expected Impacts

- The pest diagnostic and advisory service has contributed to saving millions of dollars from pest damage to crops. For example, surveys, monitoring and prevention for diseases like blackleg of canola has saved the canola producers millions of dollars in crop losses from this devastating disease.
- The use of the computer program for crop loss estimation due to weeds has helped farmers reduce herbicide use in the prairie provinces by 15% or more. In Alberta this translates to reduced input costs of approximately $20 million annually.)
- Development of cost effective methods for rehabilitation of soil sterilant affected sites and oil and gas well leases will immediately benefit the energy industry and the farming community.
- Use of biocontrol techniques for control of insect pests, plant diseases and weeds is both economical and environmentally safe compared to chemical control.
- Research on ecological approaches to pest management will continue with emphasis on cultural practices such as reducing the impact of pests on crops by increasing crop seeding rates, decreasing row spacing, and planting insect and diseases resistant crop cultivars, both in conventional and conservation tillage systems will lead to reduced use of chemical pesticides.

Environmental Toxicology

Mission: To provide collaborative applied research, analytical service and technical development projects to characterize the effects and assess the risks of chemical and physical environmental changes in animals, including man

This mission includes research projects to assess the acute and chronic toxic effects of chemical and physical environmental changes using experimental animals, cell cultures and biochemical systems. Biochemistry, clinical chemistry, pathology and electron and light microscopy services are also included. Field investigations essential to relating laboratory and field level situations are undertaken. Expert advice on risk and risk analysis resulting from environmental exposure to complex mixtures is also provided. Regulatory bioassays are performed for legal and compliance purposes.

Activities

- Conduct several in-depth veterinary toxicology field investigations into possible environmental contamination of livestock.
- Providing expert advice in veterinary toxicology on adverse health effects in livestock associated with the petroleum industry to the Energy Resources Conservation Board.
- Conduct research on diagnostic biomarkers of crude oil exposure and oil-field chemical exposure in cattle.
- Conduct toxicity evaluation of municipal water and industrial wastewaters.
- Cooperative study on the ecology of woodland caribou.

Expected Impacts

- Defensible enforcement of the Alberta Environmental Protection and Enhancement Act through:
- Providing the expert advice for setting regulations and standards (e.g. for pulp mills, industries, waste management and disposal practices) to the legislative bodies involved in licensing, monitoring, enforcement and prosecution; provide expert witnesses for both government and civil court cases, public hearings and governmental panels; assist in the evaluation of Environmental Impact Assessments (EIAs).
  Extending Alberta Environmental Protection's analytical capability to include heavy metals quantization in plant and animal tissues as well as biological fluids permits new research to be conducted on environmental pathways for contaminant movement in the ecosystem which is of importance to regulators and licensors.

- Enhanced protection and improvement in the states of environmental health through the recommendations based on scientific understanding of biological impact of environmental pollutants.

Environmental Enhancement

Mission: To provide collaborative applied research, analytical service and technical development projects to characterize and develop means of protecting ecosystems and restoring disturbed, degraded and contaminated habitats.

This mission provides expert advice and technical assistance on soil reclamation, revegetation of disturbed sites, the evaluation and protection of wildlife habitat, and the evaluation and management of aquatic ecosystems. Field and laboratory research focus on: the protection of soil quality by setting standards for contaminated soil clean-up and guidelines for machine use on sensitive soils

(forest, industrial sites, wetlands, native prairie); the identification, preservation and use of native plants to reclaim disturbed and degraded sites; the development of alternative forest harvest systems to protect wildlife habitat; and the protection of aquatic ecosystems to sustain fish and essential biological processes.

Soil

Activities

- Applied research in the laboratory and field on the remediation of hydrocarbon contaminated soils, concentrating on measuring the location, movement and degradation of contaminants (organic, salts and heavy metals) in relation to the protection of environmental quality.
- Identification of the effect of machine traffic on soil physical properties, especially compaction and rutting; establishing guidelines for prohibiting machine traffic on sensitive soils.
- Applied research on the effect of forest harvesting practices on the regrowth of aspen poplar.

Expected Impacts

- Alberta Environmental Protection can set new standards for the clean-up of contaminated soils based on new information relating to contaminant concentration to contaminant movement and degradation. Some deregulation can occur without jeopardizing environmental protection.
- The guidelines for protection forest soils against rutting developed as a result of this research are now used by the Alberta Forestry Services across the province.
- New guidelines for alternative forest harvest practices will be established by the Alberta Forestry Service to ensure that aspen poplar stands can regenerated on harvested blocks.

Native Vegetation

Activities

- Development and selection of lines of native grass and native legume species for use in the reclamation of disturbed sites throughout the province.

Expected Impacts

- Protection of biodiversity of native grasses and native legumes. Improvement of reclamation practices and habitat in Alberta by substituting native plants for imported species. New business opportunities for seed company(ies) and seed growers.

Wildlife Ecology

Activities

- Survey of all major biological components (mammals, birds, plants, insects, etc.) of boreal forest of Alberta, before and after harvesting.
- Definition of alternative forest harvesting practices, other than clear-cutting, that maintain sufficient habitat for the protection of wildlife.
- Development and testing of "humane" traps for furbearing animals. Setting standards for traps that reduce animal suffering to an absolute minimum.

Expected Impacts

- Alberta Environmental Protection knows the kinds, numbers, and diversity of wildlife species, plants, and insects in the part of the boreal forest that will be harvested over the next 80 years. Furthermore, Fish & Wildlife and Alberta Forestry Service now know the relationship of habitat to wildlife population. They know how much habitat and what kind needs to be protected to protect any wildlife population they choose.
- Alberta Forestry Service has an alternative method to that of clear-cutting for managing future timber harvests-- "forest ecosystems management". This system will allow approximately the same harvest yield without endangering wildlife habitat.
- The trapping industry in Alberta can proceed without interference from those who protest the effectiveness of animal traps. New traps developed by this project incapacitate animals very quickly, causing virtually no suffering. The research has led to new standards for trap effectiveness to be used across Canada and around the world.

Aquatic Biology

Activities

- The evaluation of equipment to enhance lake aeration during the winter season to protect against the massive "fish kills" caused by the lack of sufficient oxygen. Research to determine the relationship between minimum oxygen concentrations and fish survival in cold water.
- Evaluation and comparison of monitoring methods for benthic macroinvertebrates in standing and flowing water bodies.
- Regulatory aquatic bioassays, using standardized fish and invertebrate tests, to measure the effect of pollutants discharged into the water bodies in Alberta.

Expected Impacts

- Fisheries Management Division, Alberta Environment Protection, to purchase and operate recommended equipment to protect commercial and sport fisheries in the province against "winterkill" caused by insufficient oxygen. New guidelines to be established limiting the release of oxygen-demanding substances into rivers and lakes in Albert, especially during the winter. Some deregulation may occur without jeopardizing environmental protection.
- Alberta Environmental Protection uses benthic invertebrate monitoring to evaluate environmental impact caused by resource development, pollution release, etc. The selected monitoring tools will make the collection and interpretation of the data scientifically defensible. The aquatic component of sustainable development (a standard of environmental protection) can be defined more accurately.
- Alberta Environmental Protection can evaluate the quality (precision, accuracy, timeliness) of bioassays submitted by the private sector in their applications for regulatory approval. Proposed new bioassays (and associated analytical methods) can be evaluated by an unbiased party.

Natural Resource Planning Division

Research and Development

Determination of Instream Needs - pilot study designed to test new method to determine instream needs for Peace River

Related Science Activities

Biological Predictive Modelling - completed IFN studies for Willow Creek, Southern Tributaries, continued IFN studies on Red Deer River and designed and initiated IFN studies for the Bow and South Saskatchewan Rivers as well as Surgeon/Vermilion streams.

Water Quantity Modelling - done to support above IFN exercises as well as in support of development of Oldman River Dam Operational Plan, Highwood Diversion Plan, Special Areas Water Supply Project Feasibility Study.

Completed Environmental Evaluations - of Mann Lakes Study, Lesser Slave lake Ecocentre, continued work on Cold Lake-Beaver River Water Management Update, Pembina River Floodplain Management and support to Oldman River Dam Environmental Monitoring and Operations Planning.

Support - to Bow River Water Quality Council and Northern River Basins Study (120K) to Study Office, led Other Uses Component (contributions also made to Food Chain, Nutrients and Synthesis Components).

Water Use Forecasts Completed - for Sturgeon and Vermilion. Continued support to Cold Lake-Beaver River Water Management Plan Update and Pembina River Floodplain Management Study.

Laboratory Services

Water Quality Analysis - Bow River water quality samples, done to support IFN and Bow River Water Quality Council.

- Major changes from 93-94 as a result of split-up and merger of planning groups (Natural Resources Planning Branch and Water Resources Planning Division).
- Complex IFN studies still be led by Planning Division.
- Water Quantity modelling done in support of planning to be done by WRS.
- Economic assessments now to be done by Strategic Management Division rather than Planning Division.

Land and Forest Services

Forest Protection Division

The Division undertakes studies in insect and disease and in fire management, including:

- Free to grow pilot surveys.
- Growth and yield study of effects of dwarf mistletoe in jack pine.
- Forecasting impact of eastern spruce budworm caused defoliation on growth and yield of white spruce.
- In cooperative with Forestry Canada undertake a research and evaluation project to develop both existing and new capability for the FLIR system.
- Fire management modelling and technology development, including prescribed fire guidelines, enhanced suppression effectiveness, fire management decision support and fire weather modelling.
- Control of pine white pine weevil in white spruce and forest tent caterpillar on trembling aspen.
- Rate sites for armillaria root rot hazard.

- Impacts of forestry practices on arthropod biodiversity.
- Western gall rust resistance screening.

Forest Management Division

The Forest Management Division undertakes studies to obtain genetic improvement of major Alberta tree species including cooperative research on genetics, breeding and reproductive biology. It also undertakes:

- Forest growth and yield estimates of important commercial trees.
- Quality assurance of operational reforestation seedling stock and related forest tree nursery research.
- Operational reforestation/silvicultural research and related technical surveys to enhance reforestation in Alberta.
- Nutrient analysis of seedling tissue, soil, growing medium and fertilizer for production of operational reforestation seedling stock.
- Development and field testing of reforestation equipment for Alberta.
- Cooperative research on impacts of various land uses on reforestation of Alberta's forests.
- Continued education, and specialized training of government and industry reforestation staff in Alberta.

Forest Development Research Program

The Forest Development Research Program (FDRP) is largely funded by the Department but does receive matching industry contributions. The FDRP is a component of the Environmental Protection and Enhancement Fund (EPEF). A recent addition to Land and Forest Services research, the Manning Diversified Forest Products Research Program (MDFP) receives contributions based on the company's timber harvest. The MDFP Fund is a part of the FDRP.

9.7.4 Measurable Results

Identification of Departmental Priorities

Departmental priorities in research and technology development are identified through several Departmental Committees.

- The Alberta Environmental Protection Committee on Needs and Priorities in Research and Laboratory Services.

- Joint Management Consultation Committee between Alberta Agriculture, Food and Rural Development and Alberta Environmental Centre

- Alberta Forest Research Advisory Council.

- Interdepartmental Steering Committees (Directors level).

The terms of reference of these committees are presented below.

Alberta Environmental Protection Departmental Committee on Needs and Priorities in Research and Laboratory Services

The Committee will advise the Assistant Deputy Minister (ADM), Corporate and Management Service (CMS), on establishing the Department's requirements in research and analytical services for achieving its mission. The ADM is responsible for coordinating all of the Department's needs and activities in research and laboratory services.

Functions of the Committee will include:

- Establish specific needs in research and laboratory services for delivering various projects of the Department.
- Evaluate and priorize the identified needs taking into consideration budget and goals of the Department.
- Identify resources required and available for meeting the specific requirements.
- Identify the agency (-ies) which can provide the required specific service(s) and/or conduct research; e.g., AEC, ARC, U of A, private industry.

Joint Management Consultation Committee Alberta Agriculture, Food and Rural Development and the Alberta Environmental Centre

"To ensure an effective research and service partnership (of AEC and AAF&RD) in support of environmental sustainability of the agriculture and food industry."

The committee focuses:

- To develop leading edge balanced approaches to pest management which recognize longterm economic and environmental sustainability.
- To identify the environmental impact of the agriculture and food industry on soil, water and air quality and develop economic and remedial practices.
- To identify the impact of industrial activities and pollutants on agriculture including livestock and irrigation and to recommend appropriate environmental quality standards.

Alberta Forest Research Advisory Council

Alberta's forests are a valued yet complex resource. Our forest industry is dynamic, and progressive and recognises that new knowledge is necessary to continuously improve forest management. Forest research and development activities are the key to this increased understanding.

With respect to strategic planning in forest research, the Alberta Forest Research Advisory Council (AFRAC) is responsible for identifying provincial needs in this area. The Council ensures that Alberta's forest research and development goals reflect the needs of the resource and of Albertans. AFRAC brings together many of the senior people involved in forestry in Alberta to set and evaluate research goals for our province. The Council meets annually to review, and update if necessary, these research priorities.

Directors Level Interdepartmental Steering Committees

The client needs for Natural Resource Planning Division are priorized by Directors level interdepartmental steering committees which meet yearly to set priorities and deal with specific issues.

Evaluation Process

The evaluation process includes internal and external reviews through program advisory committees.

- Alberta Environmental Centre Advisory Council.
- Forest Research Program (FRP).
- Canada-Alberta Partnership Agreement in Forestry (CAPAF).
- Director's level interdepartmental steering committees.

Alberta Environmental Centre Advisory Council

The Council will advise the Assistant Deputy Minister (ADM), Research and Strategic Services (RSS), on setting direction for the Centre in conducting environmental applied research and technology development and providing analytical and diagnostic services and expert advice and technology transfer to its customers.

Functions of the Council will include:

- Review and advise on areas of high priority/interest in the environmental field.
- Advise the impact of socio-economic conditions on the Centre's future.
- Review the customers' (including AEP) requests for research and services taking into consideration budget, capital equipment and facilities, and staff requirements, and recommend priorities to the ADM, RSS.
- Review the Program Advisory Committees' reports and recommend future direction for the Programs.
- Review and advise on policies for:
  a. handling emergency or urgent environmental problems,
  b. cooperation and integration with other governments (municipal, provincial, federal), and
  c. partnerships between the Centre and universities, research organizations and private industry.
  d. Staff training and development
- Advise the ADM on other related matters as may be requested.

Program Advisory Committees

Research projects that are funded by the Forest Research Program (FRP), and Canada-Alberta Partnership Agreement in Forestry (CAPAF) are evaluated at a minimum, once a year. As most of the Land and Forest Services' research activities are in support of daily operations (e.g. genetics, equipment development, nutrient analysis, education, etc.) projects are also evaluated as part of each division's annual program review.

The priorities determined by the Department's advisory committees are implemented at the Alberta Environmental Centre through the Alberta Environmental Centre's Program Advisory Committee. The objectives of these committees are:

- To review the progress of all ongoing projects and to evaluate the Program in terms of issues addressed, accomplishments, and approval of the customers.
- To evaluate the scientific merit and relevance of new directions and priority areas for research and development.

- To advise the Director, Alberta Environmental Centre, on:
  - the progress of ongoing projects; and
  - new directions and priority areas for the Program and their technical merit and relevance.

In evaluating the Program consideration is given to:

- The missions of the Program, the Centre, the Corporate and Management Service and the Department.
- The activities at other institutions/organizations engaged in service, research and development in similar fields.
- The appropriateness of program activities with respect to short- and long-term expectations/priorities of the customers.
- The recognizable linkage with the customers for each project.

The performance measures for R&D and related scientific activities within Land and Forest Services includes:

- Peer review and Alberta Forest Research Advisory council (AFRAC) review of research reports and findings funded by the FDRTF.
- Canada-Alberta Partnership Agreement in Forestry (CAPAF) projects are subject to committee review and financial audits by provincial and federal agencies.
- Research projects funded by CAPAF and the FDRTF are presented in their respective annual reports.
- Research results of projects funded by Land and Forest Services (e.g. reports) are distributed to industry and other client groups regularly for feedback.

9.7.5 Human Resources

Human resources allocated to the research and technology development programs at the Centre are presented in table 9.7.1.

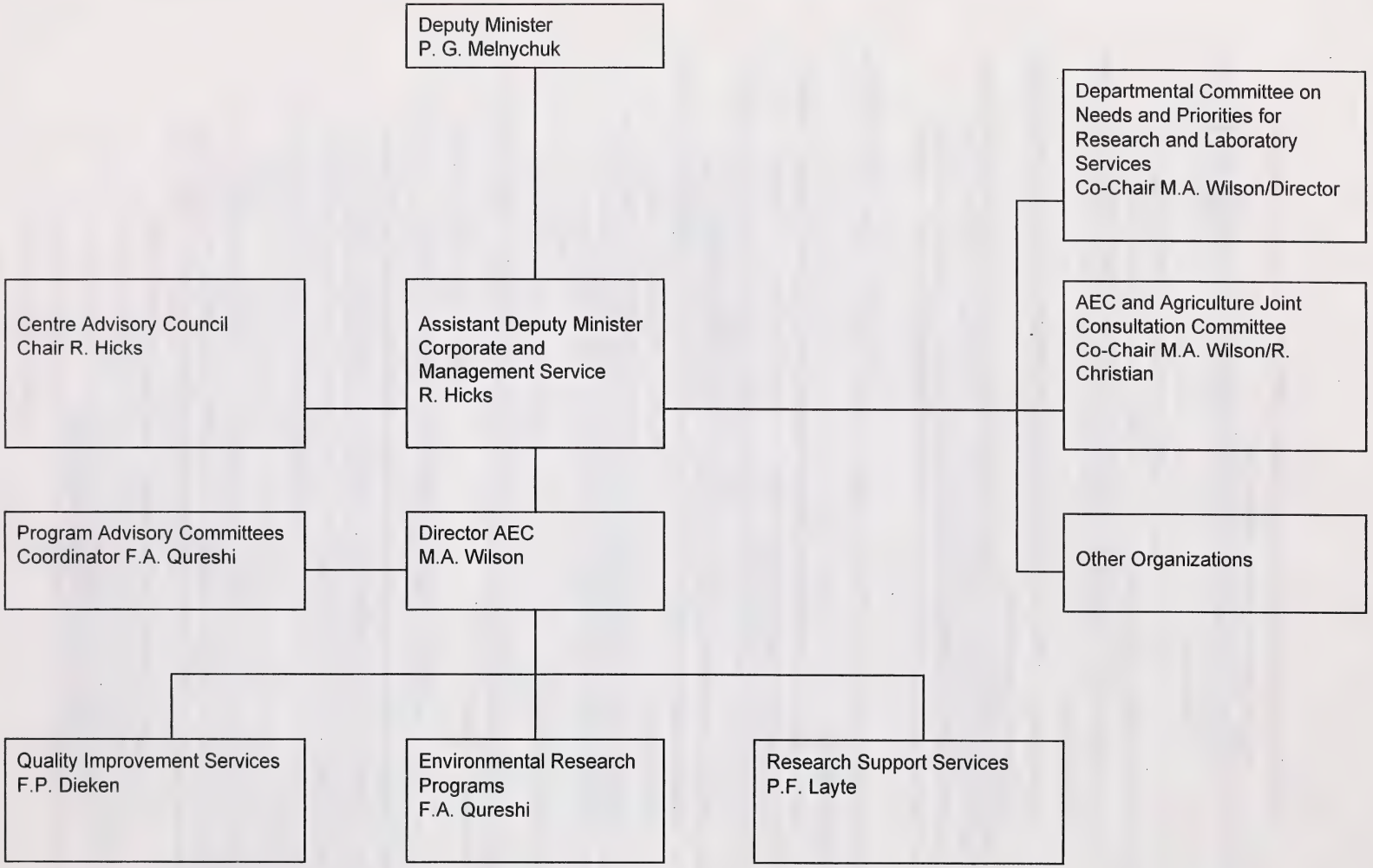
Table 9.7.1 Alberta Environmental Centre Staff* 1994/95

Staff	Permanent	Temporary	Wages	Total
Professional	53	5	2	60[1]
Technical	56	39	32	127[2]
Administration	23	5	5	33
Total	132	49	39	220

* This is based on average staffing statistics and does not reflect FTEs.

Note: 1) 5 staff are externally funded
2) 38 technical staff are externally funded

Organization and advisory mechanism for evaluating customer needs and setting priorities for research and analytical services.



9.7.6 Implementation Plan

Development of a strategy for measuring performance of the research is proposed. Because of the nature of the work undertaken by research is closely tied to the demands of our clients, performance must be benchmarked against client needs which will be defined at the outset of each project or initiative in terms of a "contract". These contracts would be negotiated with the client and would specify the objectives of the work, the expected results, the deliverable products and a timeline. They would contain an estimated of the resources (person-months and expenses) that would be committed to the project.

Project managers would be asked to provide regular status reports to ensure compliance with the "contract" and to ensure that clients are aware of any changes in schedules or manpower commitments due to other divisional priorities. At the conclusion of each project, a performance review will be conducted with clients/stakeholders to determine their satisfaction with the project, and project managers will also be asked to assess performance in terms of developing recommendations or suggestions for future study.

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- To review the progress of all ongoing projects and to evaluate the Program in terms of issues addressed, accomplishments, and approval of the customers.
- To evaluate the scientific merit and relevance of new directions and priority areas for research and development.
- To advise the Director, Alberta Environmental Centre, on:
  - the progress of ongoing projects; and
  - new directions and priority areas for the Program and their technical merit and relevance.

In evaluating the Program consideration is given to:

- The missions of the Program, the Centre, the Research and Strategic Service and the Department.
- The activities at other institutions/organizations engaged in service, research and development in similar fields.
- The appropriateness of program activities with respect to short- and long-term expectations/priorities of the customers.
- The recognizable linkage with the customers for each project.

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- Research projects funded by CAPAF and the FDRTF are presented in their respective annual reports.
  Research results of projects funded by Land and Forest Services (e.g. reports) are distributed to industry and other client groups regularly for feedback.

9.7.7 Financial Plan

Three Years 95/96 to 97/98

A calculated reduction in funding for research and development is planned as part a of the Department's contribution towards the government's deficit reduction strategy and goals (see table 9.7.2). Several steps have been taken in an effort to consolidate resources and reduce or eliminate duplications for conducting cost-effective research and technology development required to meet the priorities of the Department. Also plans are underway for privatizing and outsourcing certain activities.

The exception will be with respect to the decision to permit the Alberta Environmental Centre to enter into revenue generating research partnerships. A suggested goal is for the Centre to recover 15% of its expenditures from these external funding arrangements. A marketing effort to achieve this revenue is underway.

A major concern in many of the plans for research and technology (R&T) development investment relates to equipment recapitalization of the department's R&T facilities. As an example, the Alberta Environmental Centre transferred several million dollars worth of equipment from Edmonton in 1979 and 1980, and purchased some $25 million worth of R&T-related equipment in the next few years. Since much of this equipment is now 10 or more years old, it is worn out or obsolete. To replace old or obsolete equipment, the Alberta Environmental Centre urgently requires the implementation of a recapitalization strategy; equipment replacement costs are currently estimated at $13 million. Failure to recapitalize means the ability to provide analytical and diagnostic support services, to work on environmental problems, and to develop modern environmental technologies are all becoming increasingly compromised.

Longer Term Forecast

- Ensure that Alberta's renewable natural resources (forests, fish and wildlife, parks, water and air) are used in a sustainable manner providing sustained benefits to all Albertans; and, ensure environmental quality of air, land and water is maintained.
- Contribute to the Government's deficit reduction targets through the implementation of more efficient and effective ways of doing research and related activities.
- Integrate and consolidate the Ministry's research and development activities and facilities.

Table 9.7.2 Budget Forecast for 1994-95 and Estimates for 1995-96 to 1997-98

	94/95		95/96		96/97	
	R&D	RSA	R&D	RSA	R&D	RSA
AEC	5,813	4,398	5,583	4,217	5,359	4,041
Forestry	1,686	663	1,518	597	1,367	538
Planning	804	76	50	75	0	75
Fish and Wildlife	600	150	0	0	0	0
Water Resources	0	4,593	0	0	0	0
Environmental Regulatory Services	0	711	0	0	0	0
Alberta Environmental Research Trust (A.E.R.T.)	290	0	0	0	0	0
Water Resources Commission	100	50	0	0	0	0
Land Information	0	14,960	0	12,814	0	12,544
Total	9,2937	25,601	7,151	17,703	6,726	17,198

AEC - does not include $3 million annually for research partnerships.
Planning - includes Northern River Basin Study for 94/95.
Fish & Wildlife - $1.5 million Northern River Basin Study 94/95.

The above noted estimates are subject to change as the Department's business plan is finalized.

9.8 Alberta Health

9.8.1 Foundation

Background

For some years, there has been a growing recognition of the need to restructure the health system. Research indicates that, overall, there is a less than expected relationship between the amount spent on health care and broad measures of health outcomes such as, life expectancy, infant mortality and health status. Education, employment, housing, lifestyles and behaviour are better predictors of population health than the level of health service funding.

The current system which focuses principally on an institutionally based illness model, is in the process of being reorganised to focus on the health needs of Albertans. While essential treatment services will remain available, the future health system will be wellness-based. It will promote greater community and personal responsibility for health, encourage independence, and enable Albertans with health limitations and disabilities to stay in their own homes and communities. It must also demonstrate value for dollars spent.

The current fiscal situation, along with the recognition of the broader determinants of health, is leading to a new way of doing business that both improves the health and well-being of Albertans and, at the same time, is less costly.

The Government's vision for the health system, "healthy Albertans in a healthy Alberta," reflects the inter-relationship of health, prosperity and the environment, and is reflected in both the Alberta Health mission and Business Plan.

The Department of Health's mission is to enable the public and the health sector to restore, maintain, protect and enhance the health of Albertans. The future direction of the health system is reflected in the Alberta Health Business Plan which has identified the following four goals:

I. Maintain a continuum of affordable, accessible and appropriate high quality health services in appropriate settings and locales that ensure a client-oriented focus;

II. Increase the ability of Albertans to lead healthy and independent lives;

III. Increase financial contributions by Albertans based on ability to pay for universal health programs where premiums or other charges are currently levied; and

IV. Increase the ability of partners in the health system to demonstrate accountability for the use of health resources and the outcomes achieved.

The fundamental character of the health system will change in accordance with a series of principles and strategies identified in the Business Plan. Those most relevant to research are the following:

Principles

a) Decisions on planning, delivery and support of health services will be based, as much as possible, on evidence provided through evaluation research and technology assessment;
b) Only health services having demonstrable benefit or a reasonable potential for benefit to the recipient will be publicly funded; and
c) Funding mechanisms will encourage appropriate, efficient and effective practices.

Strategies

a) Facilitate health services research, the evaluation of new or replacement health technologies and strategies, and the communication of research findings; and

b) Develop standards and performance measures, based upon expected outcomes, to assess the appropriateness and quality of services.

Clearly the realisation of the restructuring of the health system will be directly dependent on the availability of timely and relevant research data.

Research Needs

Timely, reliable, and relevant information from research and analysis is needed for Government, Regional Health Authorities, health service providers, industry, health sector stakeholders, and the public to make informed decisions on health and health services and to achieve provincial and regional health business plan objectives.

Alberta Health is committed to meeting these research needs by:

a) funding its current research activities in 1994/95; and

b) developing and establishing the most appropriate mechanism to meet these research needs in 1995/96.

THREE YEAR STRATEGIC DIRECTION

Future Research Role of Alberta Health

As part of its Business Plan, Alberta Health has assessed its role in health research and decided that in the future, it should not:

- have a primary role as a conductor of research
- administer grant programs
- be the principal source of administrative data for research

It is felt that these functions can best be performed in partnership or through other mechanisms with relevant health stakeholders. Alberta Health will continue in a strong role of articulating a research agenda, removing barriers to data access, communicating with researchers, providing a source of grant funding and encouraging health policy decisions based on sound information and research.

Alberta Health consulted with many individuals involved in Alberta-based health research organisations regarding the future direction and organisation of health research and technology assessment in the province. The views expressed are reflected in the Alberta Health proposal to develop and establish a mechanism to integrate and rationalise research and associated activities. The proposed mechanism would also, provide a neutral health research and technology assessment resource to the Regional Health Authorities, health providers and public, and support excellent health research and its dissemination for decision-making in the province.

The primary area of emphasis over the next three years will be the funding of health services research, including technology assessment in order to support the restructuring of the health system and the efficient and effective management of the health system.

TEN YEAR STRATEGIC DIRECTION

The establishment of the 17 Regional Health Authorities, each responsible for the delivery of the spectrum of health services at the local level, was the first step towards realising the regionalized health care system of the future.

Over time, as existing facilities, programs and services are integrated and as provincial funding is reduced, new approaches will emerge for co-ordinated service delivery. There will be more opportunity for public and community involvement, and more collaborative planning and decision-making at the community and regional levels. The health system will be smaller, and new service delivery and payment arrangements will be in place.

The key strategic directions of the department over the next 10 years will likely be similar to those articulated in the Alberta Health three year business plan. Timely, accurate and accessible information from health service research, evaluation and technology assessment will be required for policy makers and health stakeholders to assist with planning and delivery of health services, and for Albertans to make decisions about their own health and utilisation of the health system.

9.8.2 Current and Proposed Programs

Current Achievements

Alberta Health funds the Health Services Research and Innovation Fund, the Mental Health Research Fund and is responsible for the Alberta Heritage Savings Trust Fund Applied Research - Cancer Research Initiative Program. Alberta Health is also directly responsible for the technology assessment function.

At present the selection of research projects in each of the grant programs is done following a peer review process that is based on international standards of scientific excellence. This process is ongoing and ensures that only those projects that meet national and international standards are funded.

Key achievements for each area are outlined below:

Health Services Research and Innovation Fund

Health research with a particular focus on health services research and innovation, contributes to improved health and enhanced effectiveness of health services. The Provincial Advisory Committee on Health Research reflects expertise in nursing, medicine, economics, social services, public health, administration and research. It reports to and advises the Minister of Health on matters relating to Health Services research and technology assessment and selects research projects for funding under the auspices of the Health Services Research and Innovation Fund.

The following research projects received operating grants in 1993/94. Since these are mostly multi-year projects, final results are not yet available:

Evaluation of an Urban Community Health Representative of Aboriginal Persons.

- Study to improve the availability of, access to and increase satisfaction with health services for urban aboriginals, so that appropriate utilisation of health services by urban aboriginals will increase and will contribute to improved health for this population.

The Edmonton Asthma Study.

- Asthma is the most common reason for admission to hospital in children and a frequent reason for emergency room visits. It is expected that standardised assessment, observation, vigorous treatment and clear discharge instructions will reduce admission rates by 50%, hospital stays, and time away from school.

Psychotherapy in Breast Cancer Patients.

- Study to investigate the impacts and benefits that result from psychotherapy treatment to breast cancer patients. It aims to demonstrate that patients with breast cancer who receive a psycho-therapeutic intervention will show improved coping skills and less stress, and also change the way they use health care resources.

Maternal Exercise, Fetal Position and Outcomes of Labour and Delivery.

- An evaluation of a primary prevention strategy consisting of a hands-knee exercise, performed by pregnant women during the last few weeks of pregnancy. This is expected to a) decrease the length of the second stage of labour, b) lead to fewer fetal and maternal complications, c) use of fewer interventions, and d) the use of fewer health care resources for labour, delivery and recovery.

A Universal Hearing Screening Program.

- Current methods of early detection of hearing loss in infants are ineffective. A new method, based on distortion product emission (DPE) testing, is proposed for universal screening of hearing in newborns. DPE testing is an inexpensive way of assessing inner ear function and hearing.

Evaluation of the Effectiveness of the Standardised Program in Infant Resuscitation.

- Significant resources are being utilised for neonatal resuscitation programs and we need to determine if these programs are being effectively used in clinical practice. The Interactive Voice Response (IVR) system will be compared to the traditional charting method of documenting acute clinical care. It is expected that the IVR will contribute to both improved documentation and more effective provision of neonatal resuscitation through clinicians.

A Randomised Controlled Trial of Laparoscopic Excision of Endometriosis for the Control of Pelvic Pain.

- One of the major causes of disability and pelvic pain in women is endometriosis. Recent attention has focused on the role of laparoscopic excision of endometriosis, but this intervention has not been evaluated. Such an evaluation is very important to ensure appropriate health care utilisation and to prevent inappropriate procedures.

The Value of Lumbar Spine Radiographs in the Management of Patients with Low Back Pain.

- Low back pain (LPB) is a major cause of discomfort and disability and is the second most common reason for physician visits. Although x-rays are the primary method used to obtain a firm diagnosis, the probability of encountering disease is less than 1-2%. Spinal x-rays may also have serious side effects, including possible links with leukemia and genetic disorders. Therefore, the aim of this study is to determine the effectiveness of using x-rays in the primary care setting through the development and evaluation of clinical practice guidelines. As a result, the potential savings to the health system should be substantial.

Formulation Grants

- Formulation grants were also awarded in the areas listed below. These grants are intended to assist prospective applicants to HSRIF in developing sound research proposals where individuals have interesting research questions but have a limited research background or experience.

A Project to Reintegrate Elderly Hospital Patients Into Society.

- This demonstration project aims to remove geriatric patients from an area hospital and place them with foster families. This will help the elderly to reintegrate into society, decrease cost for care and increase the quality of life for those individuals.

A Cost-Benefit Analysis of a Community-Based Outreach Program for Chronically Mentally Ill People.

- This projects aims to provide outreach support to chronically mentally ill people with little family or community supports. It is hoped that this project will also demonstrate the cost-effectiveness of outreach programs as well as reducing demands for more costly interventions.

Personal Management and Coping Strategies for Native Diabetics.

- Since native communities experience a much higher rate of diabetes than the rest of the population, managing and coping with the effects of diabetes are critical. This project aims to develop a personal care management strategy to assist individuals in caring for their disease.

Continuing Research Projects

- The following projects initially received funding in 1992/93 and are multi-year projects. Overall, the projects are proceeding according to schedule and the final results will be published, disseminated and discussed in the appropriate forums when completed.
- Screening Program in Alberta for Women with Cancer of the Cervix.
- Glenrose Rehabilitation Hospital Education and Support Groups for Family Caregivers of Brain Injury.
- The Medical and Economic Impact of an Outpatient Program to Treat Patients with Congestive Heart Failure.
- Evaluation of a Fitness-to-Drive Assessment Program for Cognitively Impaired Elderly People.
- The Alberta Endoscopy Project.
- The Economic Cost of Health Care System Inefficiency.
- Economic Assessment of the Emergency Subcommittee's Classification System.
- Ambulatory Care Reimbursement: Does the Reimbursement Model Encourage Increased Ambulatory Visits?
- Cost Effective Methods for Diagnosis and Treatment of Obstructive Sleep Apnea.

Alberta Mental Health Research Fund

The Alberta Mental Health Research Fund is intended to promote Alberta based research and research training in the field of mental health. Project selection is done by a committee of experts external to government, and is used to support a wide range of research and research related activities contributing to new knowledge in the field of mental health.

General Outcomes

The following are some of the results of research funded by the AMHRF that have resulted in improvements in direct service delivery to Albertans.

- development of measures that are currently being used across North America to investigate developmental motor problems in children.

- development of clinical assessment instruments for assessing child and family psychopathology.
- development of more effective treatment in the area of child psychopathology.
- development of new group treatment for schizophrenics.
- more effective counselling of families who believe that food is affecting their children's behaviour.

Specific Research Projects - 1993/94

- Dexamethasone suppression, depression, and negative symptoms in schizophrenia.
- GABA receptors and the actions of antidepressant/antipanic drugs.
- Study of the effects on the judicial system and the factors affecting hospital readmission.
- Metabolism in marriage: An investigation of cognition and behaviour.
- Dopamine receptor mediated changes in rewarding effects of mesolimbic brain stimulation: Alternation by chronic antidepressants.
- Predicting depression in relocating elderly: The role of social support and perceived control.
- Interaction of type of psychotherapy and type of patients.
- Tardive dyskinesia and its relationship to cognitive decline in patients with schizophrenia.

Student Scholarships

- Dopamine and antidepressant drug action.
- Importance of chirality and metabolism in the actions of the antidepressant fluoxetine.
- Neural substrates of stimulated psychoses and cocaine addiction.
- The effect of confident relationships and negative staff support on the well-being of nursing home residents.
- Mechanisms of action of drugs used to treat refractory depression.
- How adult women who have experience father-daughter incest explain the sexual abuse.
- The role of dopamine and calcium channels in stimulant-induced behaviours.
- Mechanisms of action of the antidepressant phenelzine.
- Tardive dyskinesia and its relationship to the positive and negative symptoms in patients with schizophrenia.

Continuing Research Projects

The following projects initially received funding in either 1991/92 or 1992/93 and are multi-year projects. The final results will be published, disseminated and discussed in the appropriate forums when completed.

- Pretherapy training to reduce early dropouts in the treatment of maltreating parents.
- Treatment outcome of aggression management for abusive parents.
- Depression in schizophrenia.
- Depression and outcome in schizophrenia.
- Musculoskeletal and ventilatory determinants of panic susceptibility.
- Association between depression and attention deficit hyperactivity disorder.
- Information processing and hemispheric lateralization in paranoid and non-paranoid schizophrenics and their first degree relatives.
- Developmentally disabled children and their families.

Technology Assessment

Health technology assessments are comparative analyses which focus on such aspects of the technology as safety, efficacy, effectiveness both in cost and consequences and social and legal implications. Health Technology is being defined in broad terms to include drugs, devices, equipment and procedures used in the maintenance, restoration and improvement of health.

Health technology assessment fosters an outcome orientation and evidence based decision making with respect to planning, delivery and use of effective health services. The Alberta Technology Assessment Management Committee has the mandate to establish a provincial health technology assessment process accessible to all health care stakeholders through an appropriate administrative and operational structure. Its functions include: identification of the need for information; the prioritisation and selection of technology assessment projects; review and approval of assessment reports; dissemination of assessment results and the evaluation of the impact of technology assessment activities. The committee is comprised of experts external to government, and is supported by Alberta Health staff.

Specific Assessment Projects - 1993/94

The Use of Clinical Guidelines in the Management of Magnetic Resonance Imaging Services in Canada

The intent of this study was to determine to what extent clinical guidelines are used in the management of MRI services in Canada and to compare management strategies (those with and without guidelines) in terms of: referral patterns, eligibility criteria/guideline content; development, dissemination, and evaluation processes; and basic utilisation data.

Multiple Chemical Sensitivities: Diagnostic Determinants

This study focused on the clinical aspects of diagnosis and related diagnostic tests for multiple chemical sensitivities excluding chronic fatigue and sick building syndromes.

Western Canadian Symposium on Health Technology Assessment

A two day symposium was organised in conjunction with the Universities of Calgary and Alberta for health care decision makers and evaluators. The first day provided presentations on the multi dimensional nature and potential benefits of health technology assessments. The second day offered a practical workshop on critical literature reviews, meta-analysis and economic evaluations.

Alberta Heritage Savings Trust Fund - Applied Research Cancer Research Initiative Program 1993/94

The Alberta Cancer Board offers cancer care and treatment, and also operates a research program funded by the Alberta Heritage Savings Trust Fund. It competes for further funding from provincial, national and international research granting agencies and industry.

The Alberta Cancer Board provides leadership in cancer research nationally and internationally and avoids duplication of effort through close relationships with Alberta universities, the Alberta Heritage Foundation for Medical Research, the National Cancer Institute of Canada, the Medical Research Council of Canada; and through co-operative ventures with other agencies and collaborations among researchers.

Project assessment is continuous and utilises scientific peer review, and distinguished unbiased advisors in the relevant fields.

(a) Contributions to the Understanding of Cancer

Research in the following areas was supported.

- Mechanisms of gene amplification in response to anti-cancer drugs.
- Molecular genetics and carcinogenesis.
- Mechanisms of transformation and metastasis.

- Nucleoside transport systems in human cells: New strategies in chemotherapy of neoplastic disease.
- Mechanisms in follicular centre cell lymphoma genesis.
- Mechanisms of cellular adhesion in acute lymphoblastic leukemia.
- Integrins and homing receptors on Myeloma B cells.
- Transgenic mice in development and disease.
- Mechanisms of interaction between radiomodifiers and DNA-repair systems.

(b) Contributions to the Treatment of Cancer

The following national clinical trials were supported during 1993/94:

- Pediatric oncology group clinical trials.
- Radiation therapy oncology group clinical trials
- National Cancer Institute of Canada clinical trials.
- National surgical adjuvant breast program clinical trials.

The following studies were supported:

- Alberta radiotherapy dose optimisation study (ARDOS).
- The synthesis, preparation and clinical evaluation of the role of novel radiopharmaceuticals in the diagnosis, management and treatment of patients with cancer.
- Hypoxic biology of human gliomas.
- A strategy for treatment of chronic lymphocytic leukemia (CLL) with 2-chlorodeoxyadenosine (2-CdA).

(c) Contributions to the Prevention of Cancer

- Health effects of pulp and paper mills.
- A comparison of cancer prevention strategies: personalised advice delivered by letter or electronic media.

(d) Contributions to the Research Workplace

- Operation of flow cytometry laboratory.
- Health Sciences Centre flow cytometry facility.
- Institutional Research Program - Tom Baker Cancer Centre.
- Institutional Research Program - Cross Cancer Institute.
- Development of a research database.

(e) Contributions to the Development of Research Partnerships

- Cloning of the ataxia-telangiectasia genes.
- Novel technologies related to treatment of lymphoid malignancies with 2-halopurine nucleosides.
- The development and application of a tissue transfer technique for tumor characterisation and diagnosis.

Proposed Programs

Alberta Health is currently exploring ways to facilitate health research and technology assessment in the province. This is the result of an expressed need to promote evidence-based health policy decisions to improve the health status of Albertans and more efficiently manage the health system.

The key functions that need to be addressed within this context are as follows:

1. **Development and Co-ordination of a Health Research Agenda for Alberta.**.

2. **Promotion of Health Research and Support to Regional Health Authorities and Provincial Boards**.

3. **Utilisation and Outcomes Monitoring and Analysis.**

4. **Technology Assessment**

5. **Grant Administration**

6. **Communication and Dissemination of Health Research Results**.

7. **Facilitate Access To Data Bases**.

8. **Interprovincial and International Collaboration.**

Whatever mechanism is selected to address these functions, the following two key objectives will need to be fulfilled:

- The research needs of health service decision makers will need to be linked to the activities of professional researchers
- Potential funders of research will need to be linked to:
    1. help set research agendas, and
    2. through project funding and other means, encourage researchers to meet health service research priorities.

Specifically, the type of research expected to be funded will be aimed at supporting administrative and management decision making in the newly established Regional Health Authorities. If the Regional Health Authorities are to truly assist the Government in transforming the health system in accordance with both the Provincial and Alberta Health business plans, this type of information is critical.

9.8.4 Measurable Results

Whatever means are selected to meet the functions articulated above, the most visible measure for success in the long run will be whether research results are utilised to support evidence-based decision making regarding the direction and management of the health care system. Other associated measures of success will relate to improved access to data, more collaborative inter-sectoral research and increased dissemination of research results.

Evaluation Process

Once the options to meet these research needs are reviewed and a mechanism is selected a detailed strategic plan that outlines the mission, goals, objectives and action steps will have to be developed. Detailed criteria for success measures will also have to be developed with input from the key stakeholders. Based on this information, a detailed evaluation plan will be developed to ensure that the mechanism selected continues to meet Alberta Health and stakeholder needs following three years of operation.

9.8.5 Human Resources

Alberta Health has identified approximately 28 FTEs associated with both Research and Development and Related Scientific Activities in the Scientific Activities Survey 1993/94. Most of the staff whose time comprises the 28 FTEs only spend a portion of their time on these important activities. The great majority of staff associated with the scientific activities also have other primary responsibilities that are important to the functioning of the Department.

9.8.6. Implementation Plans

The Alberta Health R&D plan centres around the development and establishment of a mechanism which will contribute directly to meeting the goals of the Alberta Health Business Plan. The Business Plan is the result of an extensive consultation process with health sector stakeholders and the public. It is a vision about the future shared by health stakeholders. Therefore, in order to help realise that future, it is proposed that Alberta Health establish a mechanism to fulfil the functions associated wit its research needs in the 1995/96 fiscal year.

9.8.7 Financial Plan

a.) **Four Years (1994/95 to 1997/98)**

The 1994/95 estimated expenditures for Research and Development (R&D) and Related Scientific Activities (RSA) are projected to be $6.4M. The approved budget for 1995/96 includes $700,000 for the development and expansion of extra-mural research activities. Depending on the mechanism selected for this purpose in 1995/96, the research budget will be impacted accordingly over the next three years.

Tables 9.8.1 and 9.8.2 identify the current projected expenditures for 1994/95 and estimates for the next three years.

b.. **Longer Term Forecast**

Longer term research budget forecasts are difficult to make at this time. Once the development and expansion of extra-mural research activities occur, financial and "in-kind" contributions will be sought from the Regional Health Authorities, universities and private sector.

TABLE 9.8.1 Alberta Health Research Expenditures ($ Millions)

	1993/94 Actual		1994/95 Forecast		1995/96 Estimate	
EXTRAMURAL	R&D	RSA	R&D	RSA	R&D	RSA
Alberta Heritage Savings Trust Fund Applied Research - Cancer Research Initiative Program	2.80	--	2.80	---	2.80	----
Alberta Mental Health Research Fund	0.67	--	0.67	----	0.67	---
Health Services Research and Innovation Fund	0.36	0.53	0.30	0.50	0.30	0.50
Development and Expansion of Extra-Mural Research Activities	--	--	-	--	0.70	
Other Studies in Alberta Health*	0.34	0.79	0.31	0.67	0.31	0.67
INTRAMURAL						
Other Studies & Related Activities**	0.24	0.54	0.23	0.70	0.23	0.70
Administration of Extramural Studies***	0.16	0.11	0.17	0.09	-	--
TOTAL:	**4.57**	**1.97**	**4.48**	**1.96**	**5.01**	**1.87**

Source: Scientific Activities Survey 1993/94.

* Funded by Alberta Health but carried out by other organisations, examples are development of a framework model for health units environmental health programs; and microbiological analysis of organisms present in biomedical work.

** Studies and related activities carried out within Alberta Health, examples are library services and development of statistical reports.

*** Staffing, administration and advisory committee expenses associated with the operation of the Research Funds and other extramural studies.

TABLE 9.8.2 ALBERTA HEALTH RESEARCH EXPENDITURES ($ MILLIONS)

	1994/95 Forecast	1995/96 Estimate	1996/97 Estimate	1997/98 Estimate
EXTRAMURAL				
Alberta Heritage Savings Trust Fund Applied Research - Cancer Research Initiative Program	2.80	2.80	2.80	2.80
Alberta Mental Health Research Fund	0.67	0.67	0.67	0.67
Health Services Research and Innovation Fund	0.80	0.80	0.80	0.80
Development and expansion of extra-mural research activities	-	0.70	0.70	0.70
Other Studies in Alberta Health*	0.98	0.98	0.98	0.98
INTRAMURAL				
Other Studies & Related Activities**	0.93	0.93	0.93	0.93
Administration of Extramural Studies***	0.26	-	-	-
TOTAL:	**6.44**	**6.88**	**6.88**	**6.88**

Source: Scientific Activities Survey 1993/94.

* Funded by Alberta Health but carried out by other organisations, examples are development of a framework model for health units environmental health programs; and microbiological analysis of organisms present in biomedical work.

** Studies and related activities carried out within Alberta Health, examples are library services and development of statistical reports.

*** Staffing, administration and advisory committee expenses associated with the operation of the Research Funds and other extramural studies.

9.9 ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH (AHFMR)

9.9.1 Background:

AHFMR was established by an Act of the Alberta Legislature in 1979. Its mandate was unequivocal: To establish and support a balanced, long-term program of medical research based in Alberta, and directed toward the discovery of new knowledge and the application of that new knowledge to improve the health of Albertans and all people.

AHFMR was given an initial endowment of $300 million to be assessed for its adequacy after six years. Operations are funded from some of the investment earnings of the endowment to ensure that the fund remains intact. The Foundation was designed to be at arms-length from the government. It is run by a Board of Trustees with representatives from the universities, the medical profession and the general community. The Scientific Advisory Council advises on policy and major funding thrusts to ensure activities supported are of the highest standards. In addition, every six years an International Board of Review assesses the productivity and effectiveness of AHFMR.

The 1993 International Review Board, a group of world renowned medical experts, assessed AHFMR and gave it an honours report card. The board acknowledged AHFMR has made Alberta one of the leading centres for medical research in North America and that our researchers can hold their own with the best in the world.

Foundation grants and awards consist of:

a) Personnel awards and establishment grants for senior scientists recruited to Alberta in co-operation with the universities and other Alberta institutions;

b) Training programs for young scientists;

c) Research support and infrastructure programs including equipment and conference grants;

d) Technology Commercialisation funding to support commercialisation of innovations in universities and industry;

e) Special initiative funding in health research and other areas.

AHFMR Achievements:

1) AHFMR researchers have earned international acclaim for their pioneering work in areas such as: heart attack therapy, transplantation of insulin-producing cells for diabetics, nerve regeneration, cholesterol studies, the cell biology and genetics of cancer, drugs for viral infections including hepatitis B and Chronic Fatigue Syndrome, electrical therapy for paralysed people, vaccine development for malaria, meningitis, and diabetes, improved understanding of arthritis, causes of high blood pressure, diagnostic tests for ulcers, lupus, knee injury, cancer, and other conditions.

2) AHFMR researchers have made Alberta a leading medical care centre in North America. They have established specialized patient care clinics for Alzheimer's disease, lupus, joint injuries, diabetes, thyroid disorders, cancer, heart disease, multiple sclerosis, hearing disorders, neonatal medicine, and other conditions.

3) For every AHFMR dollar invested, medical researchers now attract two additional dollars in external funding from public and industry sources. These dollars would not have come to Alberta without AHFMR investment.

4) Innovations coming out of Heritage medical research labs have commercial spin-offs and become the basis for new companies. The AHFMR Technology Commercialisation Program aids this process. It also supports innovators in industry.

5) AHFMR has supported more than 3,000 research training positions for young people.

Funding Partners:

Alberta biomedical and health research is concentrated in Edmonton and Calgary at the following institutions: The University of Alberta, the University of Alberta Hospitals, the Cross Cancer Institute, the Royal Alexandra Hospital and other teaching hospitals, the University of Calgary, the Foothills Hospital and the Tom Baker Cancer Centre. Recruiting and planning is conducted in co-operation with these institutions.

The primary sources of outside dollars are: the Medical Research Council of Canada, the Canadian Heart Foundation, and other voluntary agencies, the National Cancer Institute, the National Health Research Development Program, the Federal Network Centres of Excellence, and the pharmaceutical industry.

AHFMR Major Funding Partners:

The Universities of Alberta, Calgary and Lethbridge; the University of Alberta Hospitals; the Royal Alexandra Hospital; the Glenrose Rehabilitation Hospital; the Foothills Hospital; the Calgary General Hospital; the Department of Economic Development Trade and Tourism; the Alberta Cancer Board; the Medical Research Council of Canada; the Canadian Heart and Stroke Foundation; the National Cancer Institute; the Terry Fox Foundation; the National Institutes of Health (USA); the National Centres of Excellence; the Industrial Research Assistance Program; the National Health Research and Development Program; the Canadian Diabetes Foundation; the Juvenile Diabetes Foundation; the Canadian Lung Association; the Alzheimer's Society and many other voluntary associations.

1993-94 Examples of Partnership Funding:

* Three Edmonton researchers received $450,000 from Ciba-Geigy Canada Ltd. to study post heart attack and stroke problems.

* AHFMR committed half a million to help AHFMR scientists Dr. Sam Weiss and Dr. Brent Reynolds start their spin-off biotech company., NeuroSpheres Ltd. Subsequently, the company received commitments exceeding $4 million from three pharmaceutical/biotech companies, and the Medical Research Council of Canada has committed over $1 million to Dr. Weiss' research

  The new smooth muscle research group at the U of C received $2.5 million from the Medical Research Council of Canada, and the Canadian and American Heart and Stroke Foundations.

The Benefits:

AHFMR activity provides Alberta with new knowledge for improved health care, particularly critical at a time when health care services in the province and all over Canada are being restructured for maximum effectiveness and efficiency.

AHFMR brings social and economic benefits through: the millions of outside research dollars brought into Alberta, job creation (researchers and support personnel), research career training for Alberta's youth, and commercialisation of innovations.

1993-94 Highlights:

* New investigators were recruited to Alberta, including an expert in stroke research who is leading Alberta tests of revolutionary treatments that may reduce brain damage after a stroke.

* Discovery of a factor which may account for premature birth.

* New understanding of how some cancers may originate through unusual cell mutations.

* Discovery that damaged nerve cells of animals can recover in cell cultures, paving the way for advances in therapy for Alzheimer's disease and other neurological conditions.

* Establishment of the Alberta Health Knowledge Network to give all medical and related professionals access to current medical research and health administration databases on the electronic highway.

* Initiated an innovative program of research on the ethics and law of human genetics, co-sponsored by the Health Law Institute at the University of Alberta.

* Series of workshops on health research and planning, featuring international experts on subjects such as preventive care, and cost-effective drug practises for health care systems.

* Early stages of commercialisation completed for: an electric glove for paralysed people, a device to test hearing, a brain-imaging device, a diagnostic test for whooping cough, and other innovations.

* Partner in initiating the Alberta Pharmaco-Economics Institute to promote and co-ordinate industry investment in Alberta, facilitate cost-effective use of drugs, and manage other related issues.

Evaluation of 1993-94 Activities:

Evaluation of individuals and of AHFMR programs is continual, using outside, unbiased advisors who assess individual researchers relative to the national and international leaders in their fields, and assess our programs relative to the leading medical research institutions in the world. If scientists' research do not meet these standards, their funding is not renewed at the end of a three or five-year term.

One measure of evaluation is the number of research dollars the medical schools attract, in large part by AHFMR personnel, who bring in two dollars for every dollar AHFMR invests. AHFMR funding has moved the University of Alberta, Faculty of Medicine from eleventh to fifth place in research funding and the University of Calgary from fifteenth to ninth, in comparison to the sixteen medical schools in Canada.

Another telling measure is the commendable number of national and international awards AHFMR scientists receive.

The Planning Process:

The directions of AHFMR programs are determined by the Trustees, after consulting with a network of more than 300 advisors from Alberta, Canada, and other countries. Their expertise covers medical research, health, education, economics, technology commercialisation, and related fields.

Generally, planning is based on the 1992 strategic plan established after consultation with the major research and health-related stakeholders in the province.

AHFMR communicates regularly with other provincial and national organisations to co-ordinate AHFMR activities in the larger context of research, health care, education, and economic development. The

President meets regularly with the Ministers, staff and committees of Alberta Health, the Department of Economic Development and Tourism, the Department of Advanced Education, and Treasury.

AHFMR management personnel are active in or work with: The Technology and Research Advisory Committee, the Provincial Advisory Committee on Health Research, the Advanced Education & Career Development Access Fund, the Implementation Committee for Health Technology Assessment Alberta, Healthcare Opportunities Metro Edmonton, the Calgary Association of Medical Products, Licensing Executive Society, the Edmonton Council for Advanced Technology, Western Economic Diversification Canada, Economic Development Edmonton, the Medical Research Council of Canada, the National Cancer Institute, the Royal College of Physicians and Surgeons, and other national organisations.

Fiscal Management:

The Foundation operates on a portion of the interest revenue from its endowment. The investment of the endowment is managed by Alberta Treasury in consultation with the Foundation Trustees.

Final decisions about Foundation spending are made by the Trustees who weigh the mandate to support a balanced program of research that meets standards of excellence against available income, considering that a portion of the income must be added to the endowment to conserve purchasing power for the future.

Fiscal planning includes a consideration of extensive forecasting models, many of them based on a review of other successfully managed endowments in North America.

The Next Three Years:

* In 1995-96 AHFMR will recruit 8 to 10 new people, and at least 30 trainees.

* Projected expenditures for all programs is $29 million. This could vary minimally, depending on the results of recruitment and the opportunities for special initiatives which arise from the needs of Alberta Health, the universities and hospitals, and other stakeholders in Alberta or Canada.

* This level of recruitment and spending is projected for the subsequent three years.

Goals are:

1) To maintain AHFMR strengths basic biological research.

2) To provide Alberta with the expertise and research resources to help address the challenges of the health system, including the priorities Alberta Health has established. These include: appropriate, quality, cost-effective care, understanding outcomes of care, preventive health and public education, understanding the social and behavioural determinants of health, establishing priorities based on assessments of the population health of Albertans.

3) Goal #2 will be accomplished through: recruiting research leaders to Alberta, funding training opportunities for Albertans, networking with all the stake-holders to assist in a co-ordinated Alberta effort; making the AHFMR internationally recognised review system available to others who need it when recruiting personnel or mounting projects; responding to special needs and appropriate initiatives arising from government, education, medicine, public health, social services, and the community at large.

4) To support a balanced portfolio of the range of research which extends from molecules in the lab to population health in the community.

5) To support world class research. Standards will be maintained by awarding funds in consultation with major partners, and according to the results of stringent peer review by international leaders.

6) To continue technology commercialisation funding to assist Albertans in bringing innovations to the marketplace. This includes additional funding and consultative assistance for projects which were successful in the early stages and will likely come to fruition in the next three years.

7) To continue providing leadership and advice to many national medical research agencies and related industries, and to continue promoting Alberta through AHFMR's national and international reputation.

8) To maintain communication programs for youth and public support of science and technology in Alberta.

Projected Impact 1995 - 1998:

Many AHFMR scientists will be national and international leaders in their fields, resulting in improved medical education and health care in Alberta, more outside research dollars brought to the province, and more opportunities for economic diversification.

9.10 ALBERTA RESEARCH COUNCIL

9.10.1 Executive Summary

The Alberta Research Council (ARC) advances the economy of the province through the success of its clients and partners. Clients and partners range from small start-up companies to large multinationals, as well as municipal, provincial, and federal government departments. It is conservatively estimated that clients and partners of the ARC create more than $100 million of new wealth annually for the Province of Alberta as a direct result of their collaboration with the ARC.

The Alberta Research Council's three-year plan forecasts that overall revenues will decrease from $41.9 million in FY1994/95 to $37.6 million in FY1997/98 (10.3% decrease). This is exclusively due to the very large decrease in revenues forecast from Alberta provincial government sources (grant investment and contract revenues). Revenues from provincial government sources are forecast to decrease from $26.8 million in FY1994/95 to $21.0 million in FY1997/98 (21.6% decrease). During the same period, revenues from nonprovincial government sources (primarily industry), are forecast to increase from $15.1 million in FY1994/95 to $16.6 million in FY1997/98 (9.9% increase). As a result, by FY1997/98, more than 44% of all ARC revenues will be from nonprovincial government sources.

Notwithstanding the reduction in government revenues, the ARC will increase its impact on wealth creation in the province to $110 million annually by FY1997/98 by increasing mission effectiveness from 4.4:1 in FY1994/95 to 5.6:1 in FY1997/98 (27.3% increase). Increased mission effectiveness will be achieved through the following strategies:

- focus on technology commercialization
- improved marketing
- increased emphasis on joint ventures
- maintaining a healthy corporation
- improved stakeholder satisfaction

The Alberta Research Council will focus its efforts to serve clients and partners in the following sectors:

- manufacturing
- forest products
- pulp and paper
- biotechnology
- information technologies
- energy breakthrough technologies
- energy technologies
- environmental technologies

9.10.2 Foundation

Mission and Vision

The mission of the Alberta Research Council is:

> Responding to the needs of the private sector, and supporting activities of the public sector, *the Alberta Research Council will advance the economy of the province by:*
> - promoting technology development and application,
> - performing applied research, and
> - providing expert advice, technical information, and scientific infrastructure.

ARC's vision set out in the Corporate Plan, "A Vision to the Year 2000", is:

By the year 2000, the Alberta Research Council will be an internationally recognized technology corporation, a valued and important partner in the emergence of a globally competitive Alberta.

ARC advances the economy of the province through the successful commercial exploitation of technology by its clients and partners. Clients and partners range from small start-up companies to large multinationals and municipal, provincial, and federal government departments. Contractual arrangements may be fee-for-service, joint ventures, or consortia. In addition, ARC provides technical advice and information to industry, government, and the general public.

Technology enhances the success of companies by reducing their production costs or by being the basis of a new product or service. Technology serves as the basis for the creation of new companies. ARC business units, which work directly with companies, help to create wealth in the province through technology development, adaptation and adoption.

In 1993/94 ARC worked with approximately 12,000 clients. Of this number, about 1000 clients entered into fee-for-service or joint venture agreements. It is conservatively estimated that the results achieved by ARC, through its work with clients and partners, directly add more than $100M annually to the Alberta economy. First estimated in 1992/93, this contribution to the economy represented a "mission effectiveness" of four to one (4:1). That is, for every dollar of grant investment invested in ARC by the provincial government, ARC, through its clients and partners, directly created approximately four (4) dollars of wealth in the provincial economy.

Business Goals

ARC's business goals are shown in Table 9.10.1. Although core funding was reduced by 8.5% in 1994/95, ARC has been able to maintain its contribution of $100M of wealth creation to the provincial economy by increasing mission effectiveness (wealth creation divided by grant investment) to 4.4. ARC intends to increase its mission effectiveness to 5.6 by 1997/98 using the strategies outlined in Section F. ARC also intends to dramatically increase its impact on the stimulation of export sales in the private sector by preferentially working with clients that emphasize export sales.

Table 9.10.1

BUSINESS GOALS						
	1992/93	**1993/94**	**1994/95**	**1995/96**	**1996/97**	**1997/98**
Grant Investment	$25,429	$24,629	$22,547	$21,037	$19,527	$19,527
Mission Effectiveness	3.9	4.1	4.4	4.7	5.1	5.6
Wealth Creation	$100M	$100M	$100M	$100M	$100M	$110M
Export Sale Stimulation	-	-	$60M	$60M	$90M	$100M
Job Creation Stimulation	3,000	3,000	3,000	3,000	3,000	3,300

9.10.3 Programs

In response to the government's expenditure reduction initiatives, a strategic decision was made to phase out core funding from a number of program areas over a three-year period (1994-97). Implementation of the phasing out of these program areas is now complete for some, and well advanced for others as follows:

Alberta Soil Survey - The Alberta Soil Survey has been privatized. Four employees have formed a private company, SLRI Consultants, which has been retained by Alberta Agriculture, Agriculture Canada, and the Alberta Research Council to complete a project to consolidate existing soils survey information into a digital soils database of the agricultural regions of the province.

Surface Water Engineering - The Surface Water Engineering group has been privatized. The five employees associated with this program have established a private company, Trillium Engineering and Hydrographics Inc.

Humane Trapping - This program, and the five staff associated with it, have been transferred to the Alberta Environmental Centre in Vegreville.

Gasoline and Oil Testing - This program will be retained at ARC but will become fully self-sufficient by FY 1996/97.

Electronics Test Centre - The privatization of the ETC has been initiated and is still in progress.

Alberta Geological Survey - ARC's strategic intent is to phase out grant funding and transfer some staff of the Alberta Geological Survey (including groundwater survey) to Alberta Energy. Discussions with Alberta Energy in this regard are well advanced.

Pavement Management Research - Discussions with Alberta Transportation and Utilities on the future of this program are in progress.

As a result, ARC has narrowed its focus to serving clients in the following program areas:

Manufacturing	•	manufacturing processes, advanced materials, product development
Forest Products	•	engineered wood products
Pulp and Paper	•	pulp and paper process engineering
Biotechnology	•	biopharmaceuticals, process engineering
Information Technologies	•	information technologies development and application
Energy Breakthrough Technologies	•	oil recovery and upgrading process development
Energy Technologies	•	energy related manufacturing, service, product development
Environmental Technologies	•	environmental services development

Manufacturing

The strategic intent is to stimulate the performance (export sales, profitability) and size (employment) of the Alberta manufacturing sector by working with the progressive and innovative companies expected to provide greater than average economic growth; to assist companies with new/improved processes, materials, and product development.

One objective is to improve the competitive advantage of Alberta manufacturers by improving their productivity through diagnostics, assessment and implementation of a variety of advanced manufacturing and information technologies.

In 1994/95, 65 engineering and technical staff worked with 365 clients through fee-for-service and joint ventures. It is expected this will grow by 10% per year through 1997/98.

A second objective to improve the economic performance of existing companies, and assist in the development of new companies through applications of advanced industrial materials, new process and product development, and evaluation.

ARC recently acquired Canada's first Cubital rapid prototyping system. This addition and expanded product development skills creates a unified and comprehensive product design centre that is among Canada's best.

In FY 1995/96, Manufacturing Technologies will achieve its business goals through the following business units and key projects:

- Advanced Industrial Materials and Processing
  - Thixomolding Project
  - Petrovalve
- Manufacturing and Engineering
  - Rapid prototyping/rapid mould making
  - Benchmarking
  - Automation/integrated manufacturing
- Industrial Materials and Chemicals
  - Royal Sweet Project
  - Gas separation technologies - O_2 Gen
  - Materials evaluation projects
- Industrial Technology Advisors
  - Industrial Research Assistance Program (IRAP)
- Gas and Oil Laboratory
  - National gasoline quality control evaluation through the Exchange Program
  - National market evaluation of petroleum products
- Analytical Laboratory
  - Department of National Defence Contract (breathing oxygen)

Key initiatives will include:

- Commercialization of presure swing absorbance(PSA), hollow fibre and permeation gas separation technologies through development contracts and licensing agreements for individual applications and uses of the technology by similar methods to the O_2 Gen Industries Inc. Agreement.
- Assist in the commercialization of the Thixomolding process by supporting Thixotech Inc. to become the world leader in the technology and by developing peripheral support technologies such as mould making design and powdered metal production.

- Compliment the rapid prototyping capability by establishing a rapid mould making capability through an alliance with NRC and an industrial partner to commercialize an NRC mould making technology creating a unified and comprehensive product design centre that is among Canada's best with the recently acquired cubital rapid prototyping system.
- Provide manufacturing process design (Gas separation technologies) and chemical process improvement (Camelot) and development technology to SMEs based in Alberta (thermal conduct ivity measurement technology).

Forest Products

The strategic intent is to stimulate the performance of wood products manufacturing companies in Alberta through the development and application of new/improved products and/or processes.

One objective is to increase the sales of Alberta-sourced wood products, especially in the areas of engineered wood composites and value-added products. Another objective is to increase the utilization of Alberta's forest resources by developing products from under-utilized fibres.

Sixteen employees operate a fully equipped panel pilot plant for scale-up of facilities and a Forest Products Testing laboratory, accredited by the Standards Council of Canada for comprehensive testing of wood products.

The rapid growth of composites in the province, with the building of two new wood composite mills scheduled for this year, will allow ARC to focus primarily in this area for 1994/95. Approximately 50% of the activity in 1994/95 is sponsored by industry-led consortia and is expected to continue. The remainder of the activity is directed to one-on-one client relationships. This activity is expected to grow over the next three years at the same rate as the industry.

In FY 1995/96, Forest Products will achieve its business goals through the following key projects:

- Core R&D program for the Structural Board Association who represent all Alberta OSB producers
- Work with individual companies to improve the fibre utilization and allow increased production.

Key initiatives will include:

- Agreement with Forintek Canada Corporation to form a joint venture to deliver R&D services in the area of wood composites.
- Expansion of the Pilot Plant to include particleboard and medium density fibreboard.

Pulp and Paper

The strategic intent is to improve the cost effectiveness and environmental performance of Alberta's pulp and paper companies and pulp and paper supply/service companies (increased exports) through the development and/or adaptation of new technology products and processes.

The objective is to enhance and improve the competitive edge of Alberta's pulp and paper industry by providing facilities and competent, skilled people to assist mill personnel in the resolution of technical issues. The development of new and emerging technologies is encouraged through strategic alliances and joint research ventures with the pulp and paper service sector.

Through a consortium arrangement with three of the province's mills, two projects dealing with improving current effluent treatment systems are being carried out with funds from the provincial government and industry. The expanded application of zero-effluent technology for its kraft mills is being developed through a joint venture with Millar Western Pulp Ltd. and NLK Consultants Ltd. A project to evaluate a special straw pulping process that would add value to a waste agricultural by-product, is being conducted in cooperation with Dupont Canada, Quantel Engineering, Vegreville Environmental Centre and New Fibres Inc.

In 1995/96 it is expected two or more kraft mill projects will be undertaken; for example, optimization of continuous digesters and utilization of mill waste materials to improve marginal agricultural land.

In FY 1995/96, Pulp and Paper will achieve its business goals through the following key projects:

- Activated Sludge Treatment System Project
- Zerotech JRV

Key initiatives will include:

- The addition of one or more new projects in the consortium because of the increased support from industry, will concentrate on raw material handling and process-related problems.
- PWS Technologies Ltd., Paprican and Alberta Industry will be participating with ARC to transfer the counter-current extraction technology into the pulp and paper area. One or two feasibility studies will be carried out in 1995/96.
- The development of processes to convert agricultural waste material such as straw to bleached pulp, will involve industry partners Dupont Canada, Quantel Engineering, and government agencies IRAP and Alberta Environmental Protection. The early indications are that small production units strategically placed throughout Alberta would be able to economically create feed material for fine paper and fibre board production.
- A technical feasibility study will be conducted into the combination of polymer and wood fibres to produce a pulp that would be used for the production of high strength paper. Initial studies completed in 1995 were carried out by ARC in cooperation with the University of Quebec. The combination of two Alberta based industrial activities in the pulp and petrochemical industries, holds promise for the creation of a new manufacturing activity.

Biotechnology

The strategic intent is to stimulate the development of a sustainable biotechnology manufacturing industry in Alberta, to be achieved by:

a) providing services and expertise to existing companies in the province, which are either in the biotechnology business, or, wish to refocus into that area. Current emphasis is on the timely and economical production of material under GMP (Good Manufacturing Practices) for SYNSORB Biotech Inc., and development for Epsilon Chemicals of commercial processes for treatment of packing house effluents. (GMP is a quality designation by the U.S. Food and Drug Administration and the Health Protection Branch, Health Canada for the production of food and drugs for human consumption.)

b) developing new companies by spinning off to the private sector, technology acquired, owned and developed for commercialization by ARC. Current emphasis is the continued research program with Glycomed. The result of this will be the in-province manufacture of synthetic pharmaceutical products.

A new focus over the next three years will be the first validated clinical production of a biopharmaceutical intermediate under cGMP (current Good Manufacturing Practices) in the pilot plant. This step will secure a market position for ARC as a cGMP manufacturer of clinical trial materials. As a result, ARC will be able to acquire, develop, and prove the value of biopharmaceutical compounds for disease treatment before licensing the technology to the private sector.

As another new focus, ARC intends to form an alliance with companies for entry into the animal health care sector for non-GMP manufacture.

The 65 employees in Biotechnology worked with approximately 30 clients in 1994/95. As new capabilities are added to the program over the next three years, the client portfolio will continue to develop.

In FY 1995/96, Biotechnology will achieve its business goals through the following business units and key projects:

- Chemistry Research Unit
  - This unit will continue the research and development program with Glycomed for the discovery of novel carbohydrate compounds with applications for the treatment of inflammatory diseases.
- Chemistry Production Unit
  - This unit will continue to manufacture 'synsorb' products for SYNSORB Biotech, Calgary, Alberta, for testing in clinical trials.
- Biology Unit
  - Epsilon Project
  - MicroBioRhizogen Project
  - Microtec Project
  - Biostar Project

Key initiatives will include:

- Development of the department's initiative to establish a capability for the manufacture of clinical trial material under GMP regulations for the biopharmaceutical industry.
- Entry into the market sector for animal health care products.
- Establishment of closer ties with the research community in Alberta to serve as a partner in the development of technology within the province.
- Establishment of a strategic relationship with Saskatchewan and the Saskatchewan Research Council

Information Technologies

The strategic intent in Information Technologies is to improve the global competitiveness of Alberta industry in two distinct ways:

a) to support the Alberta information technology sector in developing products and services, which will more effectively penetrate existing markets or establish entirely new areas of enterprise. Our objective is to improve the economic performance of companies developing products for system integration in general and for use in areas such as transportation logistics, health care, training and education. Focus is on companies which are creating products and services with significant export potential.

b) to assist Alberta industry to become more efficient through effective application of new and innovative information processing and management technologies in their business practices. Included in this effort is a specific objective towards assisting Alberta industry to utilize high speed networks.

In 1994/95, 14 computing and engineering staff from ARC worked with 20 clients in fee-for-service and joint ventures. As one of the fastest growing industries provincially, nationally and internationally, this area of activity is expected to grow rapidly over the next three years.

Current emphasis is in the following sectors: natural resources (including oil & gas, agriculture, pulp and paper, environmental, and forestry), distance education, government and manufacturing. The 13 staff in this area worked with approximately 47 clients in 1994/95. This is expected to grow throughout the next three years.

In FY 1995/96, the Advanced Computing & Engineering group will achieve its business goals through the following business units and key projects:

- Advanced Media and Learning Technologies
  - SWIFT - An Adaptive Learning Environment JRV
- Health Information Technologies
  - Synapse - Publishing Medical Literature Electronically over the Internet JRV
- Logistic Management Systems
  - RADSS - Transportation Logistics JRV
- Pattern Analysis and Machine Intelligence
  - Virtual Reality Centre of Excellence
- Process Automation and Robotics
  - DRES - ANCEAUS Commercialization (i.e. base technology for semi- autonomous vehicles)
  - PRECARN/STEAR - Investigation of Human Machine Interfaces to Semi-autonomous Vehicles
- Integrated Manufacturing (with Manufacturing Technologies Group)

Key initiatives will include:

- Develop two business units in: (1) Spatial Knowledge Engineering, (2) Communications and Network Applications (with Information Systems).
- Continue the development of collaborative relationships with universities and industry to deliver new and innovative information technologies to Alberta industry through the following programs:
  - Centre's of Excellence programs (Health, Education and Virtual Reality)
  - PRECARN Phase II
  - STEAR
  - IMS Consortium (Intelligent Manufacturing Strategies)
- Increase AC&E technology scanning activity by formalizing technology inflow activities.
- Continue to improve technology management by solidifying commercialization plans for existing AC&E technologies (HERMES, HELIOS, RADSS, SmartMaint) and further refining the commercialization processes for new and emerging technologies including developing relationships with PACT, UTI, and other sources of commercialization funding and expertise.

In FY 1995/96, Information Systems will achieve its business goals) through the following key services/business units:

- User Services
- Culture of Use
- ARnet Internet Network

Key Initiatives will include:

- Privatizing ARnet, the regional Internet network.
- Increasing the capabilities of Alberta industry through strategic use of computer networks. This will be accomplished through a new business unit focussed on communications and network applications.
- Utilizing high performance computer networking for strategic advantage at ARC. In 1995/96 ARC may join a high performance test bed network run by WurcNet. As part of WurcNet, ARC will be positioned to enter into joint research ventures on the utilization of information to improve service delivery in areas such as remote health and distance education.
- Implementation of Phase Two of the ARC Financial System. In 1994/95 a new financial information system, Prophecy, was implemented at ARC. In 1995/96 a second phase of the project will be completed, which will add more functionality and increase the flexibility of the system.
- Improving the culture of use of Information and Information Technology for achieving strategic advantage at ARC. One specific component of that strategy will be increased use of the World Wide Web on the Internet.

Energy Breakthrough Technologies

The strategic intent is to increase the development and utilization of Alberta's Heavy oil and bitumen resources through the development of "breakthrough" technologies.

The focus is on innovative high risk, high reward technology development programs with the objectives of developing technologies leading to dramatic cost reduction in the production of heavy oil and bitumen, and the upgrading to higher value and more marketable products. The problems that must be solved in order to ensure commercial viability are beyond the capabilities of a single organization. Consequently, the strategic approach is to work in partnership with, and provide to the energy industry, the advanced technology leadership crucial in building a competitive edge in the global marketplace.

In the upgrading area, a National Centre for Upgrading Technology (NCUT) is being established with CANMET (Canada Centre for Mineral and Energy Technology), which will carry out all research and development related to upgrading of bitumen in Alberta. This program is building on current ARC technology (HC3 process) with a dedicated effort to improving product quality and yield, thereby significantly improving economics.

The AOSTRA/ARC/CANMET/Industry Research Program (AACI), which involves 13 of the major national and international corporations with interest in heavy oil development, is helping companies implement thermal (steam assisted gravity drainage; top-down combustion) and non-thermal (cold-production; solvent-assisted gravity drainage) processes. The current field testing of these novel and promising processes has allowed Alberta to maintain its reputation as the world leader in heavy oil development.

The activities of the 40 multidisciplinary staff are expected to remain at an essentially constant level over the next three years.

In FY 1995/96, Breakthrough Technologies will achieve its business goalsthrough the following business areas and key projects.

In Situ Extraction (AACI Program)

- Cold Production from Mobile Reservoirs
- Partially Miscible Processes
- Sand Control in Horizontal Wells
- Wettability
- Gravity Drainage Process
- Top-down Combustion
- Formation Sensitivity
- Emulsions and Flow

Upgrading

- High Conversion (HC3) Upgrading Process
- Field Upgrading
- Transportation and Quality
- Improving Current Upgrading Operations
- Visbreaking and deasphalting
- Improved catalysts

Key initiatives will include:

- Closer coordination of BT business with industry, Alberta Department of Energy and CANMET through Canadian Oilsands Network for R&D (CONRAD) and National Centre for Upgrading Technology (NCUT).
- Adapt HC3 upgrading process to existing operations (Syncrude, bio-provincial, Co-Op refinery) and enhancing ARC's ownership of the technology, which has good economic potential for upgrading of bitumen and heavy oil into higher valued and more marketable products.
- Aggressively transfer novel sand control technology to field practice while maintaining Alberta's return on investment.
- Sign agreements with industry for new 5-year program on in situ extraction of oil sands and heavy oil and position the program to accelerate the successful field use of heavy oil recovery technology achieving a dramatic impact on the provincial economy.

Energy Technologies

The strategic intent is to stimulate growth in jobs and exports by improving the performance of Alberta's energy and energy services companies.

The objective is to work in partnership with industry to develop, adopt, adapt, and apply technology, products and processes which improve industrial competitiveness. The goal is to position ARC strategically to provide support to both energy technology end-users and developers of end-products or services by the end of FY 1994/95.

Target markets are small oil/gas producers and energy processors, in addition to associated small- and medium-size oil field service companies and equipment manufacturers. In FY 1994/95, a major marketing and customer engagement program was launched which places Energy Technologies staff in clients' field and head offices. An initial 16 Resource Technologies staff participate in the developing and delivering of businesses in Energy Technologies. This number is expected to grow rapidly and double in the next two years, principally in the area of advanced drilling and production techniques.

In FY 1995/96, Energy Technologies will achieve its business goals through the following business units and key projects:

- Oil/Gas Production Techniques and Equipment Manufacturing
  - Hydroworld JRV
- Oil/Gas Wellhead Fluid Separation and Measurement
  - Pan Canadian Project
- Energy Processing and Utilization
  - Natural Gas Utilization Project (with Natural Gas Technology Centre)
- Petrochemical Processing and Value Added Product
  - Camelot Superabsorbents Project

Key initiatives will include:

- Continue current efforts in marketing to energy sector service and manufacturing companies.
- Develop a number of joint research venture projects with oil and gas service/manufacturing companies (e.g. VanOil, Cambridge, etc.) to advance to commercialization of several of ARC's concepts or technical solutions on advanced downhole tooling and surface separation designs, generated during previous customer engagement efforts.
- Develop a business strategy in partnership with Alberta Oil/Gas equipment manufacturers, to enhance penetration of Alberta based technologies in USA/Mexico (NAFTA) Markets.
- Develop strategic alliances with key Alberta natural gas utilization players such as Northwestern Utilities etc. to foster this new sector.

Environmental Technologies

The strategic intent is to stimulate export sales and job creation in the environmental services sector of the Alberta economy. Primary emphasis is on acquiring, adapting and applying new technologies through partner relationships with the private sector.

The objective is to develop new products and services with Alberta companies that resolve or mitigate environmental impact of resource development. Using Alberta resource developers as end-users for the first products and services developed by ARC, Alberta manufacturers and service providers can then export the results.

In 1994/95, 29 multidisciplinary staff worked with 22 clients resolving problems in flaring, site remediation, land-based waste treatment and land reclamation. Through the marketing activities outlined above this number is expected to grow by approximately 10% annually through 1997/98.

A secondary emphasis will be to assist Thermo Design Engineering of Edmonton with the commercialization of jointly owned soil clean-up technology.

In FY 1995/96, Environmental Technologies will achieve its business goals through the following business units and key projects:

- Land Based Waste Treatment and Disposal
  - Alberta Newsprint JRV
  - Pulp mill sludges for land improvements
- Site Remediation
- Flaring and Incineration
  - West Central Regional Air Monitoring Program
- Clean Coal Technologies
  - Thermo Design Engineering Project (JRV)
  - US Department of Energy
- Environmental Process Engineering
- Geochemical Models for Environmental Remediation

Key initiatives will include:

- Build up a dedicated marketing and sales group and continue the shift in focus away from longer term R&D toward shorter term technology development.
- Develop strategic alliances or memoranda of understanding with CETAC, Pacific Northwest Laboratories, the Idaho National Engineering Laboratory and other institutions to provide access to a greater range of environmental technologies for commercialization.
- Develop at least one international joint venture with an Alberta company.
- Aggressive marketing to find a private sector partner to commercialize the Clean Coal/Agglomeration Technologies package.
- Aggressive marketing to find a private sector partner to commercialize the suite of geochemical and multi-phase flow models.
- A joint research venture with Pulsarc Technologies to develop applications of their technology.

9.10.4 Measurable Results

Performance Measures

The Alberta Research Council has established business goals related to wealth creation, export sale stimulation, and job creation stimulation. Results are determined by interviewing clients/partners before, during, and at intervals after completion of the project. The client/partner provides details of the impact on the company of the new technology that was developed in the project.

Key Accomplishments

A. The Computer Modelling Group (CMG) JRV which developed the RESULTS reservoir visualization software was successfully completed. In a letter from Frank Meyer, president of CMG, he made the following points: "CMG's reservoir simulation business needed a sophisticated interface to avoid obsolescence, losing market share and becoming non-competitive in the global market. Over the time of the JRV, CMG's business has grown 40% and their staff has grown from 18 to 30. CMG's current projections are to triple their business in the near term and to grow to over 50 persons in the next few years. While the main source of revenue is the actual simulators, not having RESULTS was blocking or was seen as a barrier to continuation and growth. RESULTS is a key enabling technology for the use and sale of other CMG technologies."

B. The Alberta (Wheat) Pool (AP) JRV was also started this year. This grew out of a contract that ARC undertook with AP to develop a railcar allocation program called RADSS using genetic algorithm search techniques. This innovative technology has been in use in AP for 15 months. In 1993/94

RADSS improved the throughput of AP's transportation network at an estimated value of $1M. There appears to greater impact this year. The JRV is to expand the capabilities of RADSS to include more types of products and more modes of transportation. ARC also has the rights to commercialize this technology. To date, a license has been granted to the Saskatchewan Wheat Pool for $130K with a $40K annual maintenance fee.

C. NOxSMART, a realtime expert system prototype for the control of NOx emissions in coal-fired power plants developed with Monenco/AGRA for TransAlta Utilities will be fully deployed by TAU at their Keephills power generation site. From tests done during the prototype development, NOxSMART is expected to contribute a 10-20% reduction of NOx emissions with no major refit required to the burners.

D. The SYNSORB technology has been licensed and a new private entity, SYNSORB Biotech, Inc. (SBI) has been spun off. The purpose of the licence is the commercialization of the SYNSORB technology, most notably with the new oral gastro-intestinal applications conceived through a University of Alberta and Chembiomed collaboration and subsequently developed at ARC. SBI is currently in Phase II clinical trials with its first product, SYNSORB Pk for the treatment of "Hamburger Disease".

E. Amptech Corporation of Calgary, with the assistance of Manufacturing Technologies, is commercializing a revolutionary new technology, Thixomolding, for producing near net shape parts in magnesium alloys. Amptech is expected to produce magnesium parts with sales of $10 to $20 million for automotive (anti-lock brake housing), telecommunication and defense markets. This should create over 100 new jobs at Amptech and an additional 150 new jobs in the Province, with a tax revenue increase of $5 to $10 million.

F. Petrovalve International has designed a guided valve which involved development of wear and corrosion resistant materials and coatings used in pumping crude oil. There have been 36 jobs created with sales exceeding $2.5 million annually. Exports to Venezuela are approximately $1 million.

G. Russell Technologies Ltd. won the ASTech Award for excellence in industrial research. They are the world leader in development of non destructive testing (NDT) instruments for ferrous and cast iron tubulars based on "the Remote Field Eddy Current" (RFEC) technology. With the assistance of our Industrial Technology Advisor, they developed an R & D Plan and have cooperated on research activities for several years. The two new NDT instruments developed are now sold worldwide. Revenues have increased from $1.7 million to $5.2 million annually and 28 new jobs have been created through expansion of manufacturing operations and research.

H. A joint venture with Hydroworld Technologies is underway which aims at developing an improved magnetic tool to drastically reduce wax deposition in downhole tubing. ARC's expertise in colloids is instrumental in the design of the tool internal configuration. The intent is to maximize the effect of the tool's magnetic field on wax crystals, therefore inhibiting wax deposition. To date, the results are encouraging enough for Hydroworld to initiate planning for expansion of its current manufacturing plant in Alberta. Preliminary studies indicate an immediate $25M market in Alberta for this tool. Discussions are also underway with Computalog to capture the international market which is estimated at many orders of magnitude larger.

I. ARC's Clean Soil Process has been licensed to an Edmonton company, Thermo-Design Engineering (TDE) and is slated for a demonstration at a New York site in early 1995. The process, which grew out of ARC's coal/oil/agglomeration research, is uniquely suited to cleaning soil contaminated with tar and oil emulsions. TDE expects to recover their entire investment of $1.7M in the first three years of operation and projects a substantial and continuing growth in demand for their technology.

J. Significant progress has been made in developing solid waste utilization strategies for the pulp and paper industry in Alberta with excellent opportunities to export the technology nationally and internationally. Alberta Newsprint Company (ANC) and Slave Lake Pulp have received approval to landspread pulp and paper sludges on local farms, with the farms reporting an increase in agricultural productivity of 50-100%, which translates into an increased return of $25-75 per acre depending on crop type. The land spreading operations so far have generated some $250 000 of economic activity for local service companies.

K. Seven PressMAN systems have been sold this year at an average cost of $25,000 each. In addition to selling the systems, Forest Products personnel have been contracted to demonstrate the PressMAN system at over 12 commercial mills across North America this year. This has resulted in positive exposure for the Forest Products PressMAN and ARC is recognized around the world in the panel industry. As a result, industry is looking to Alberta for their R&D needs and also as a location for new mills.

L. The Alberta Research Council has worked with Weyerhaeuser and the provincial government in increasing the utilization of alternate species for OSB production. Over the past five years, species such as black poplar, black spruce, white spruce and birch have been investigated in the pilot plant; followed by a mill trial. As a result of this work, Weyerhaeuser utilize approximately 30% alternate species in their normal production. This has reduced Weyerhaeusers' cost for the wood and also extended their wood resource.

M. The Alberta Research Council has worked with Canfibre to develop North America's first "green" panelboard. It is produced from materials normally dumped in landfills and is made without the use of conventional Urea Formaldehyde resins. Because of the successful trials conducted in our pilot plant they were able to secure funding to begin construction of a 60 million square foot medium density fibreboard plant, scheduled for December 1994.

N. A JRV with Alberta Newsprint Company was completed in which a made-in-Alberta de-inking process was developed. Access to the newsprint market in which significant quantities of recycled Fibre is required, has become a prerequisite. This projected enhanced the company's ability to compete. Exports totalling $100 million were affected resulting in the maintenance of 300 jobs at the Mill.

9.10.5. Human Resources

The Alberta Research Council understands that its employees are the key to its success and is taking steps to ensure that the very best people are recruited and trained for its business endeavours (see Section F.4 for details).

9.10.6. Implementation Strategies

As outlined in our previous three-year plan, an extensive planning process, involving many stakeholders and ARC employees, concluded ARC will accomplish its mission and vision primarily by working directly with its private sector clients and partners.

ARC believes it can provide its clients and partners with a competitive edge in the global marketplace by working with them to develop value-added technology products and processes that will lead to greater export sales and job creation in Alberta.

With an increased emphasis on working with private sector clients and partners, the following specific strategies are being adopted:

- focus on technology commercialization
- improved marketing
- increased emphasis on joint ventures
- maintaining a healthy corporation
- improved stakeholder satisfaction

Each of these strategies is discussed in more detail in the following sections.

Technology Commercialization

Although Canada ranks fourth in the industrialized countries in research and technology capacity, it ranks twenty-third, or last, in commercializing the results of the effort in this capacity. Alberta has a similar problem. Hence, a key focus for ARC is to ensure maximum commercialization of technology with, and by, the private sector.

With the focus of U.S. defence efforts towards technology commercialization, and the easing of restrictions to technology access in Eastern Europe, there is a vast supply of technology worldwide with the potential for commercialization. It is ARC's intent to provide access to global technology sources as well as local technology sources. We intend to apply our collective expertise to adapting technologies for commercialization by Alberta companies to serve the world marketplace.

Compared to our major global competitors, Canada and Alberta have a paucity of companies capable of commercializing technology. Hence, it is essential that new technology companies be formed, and assistance with their growth be provided.

One mechanism is for ARC to "incubate" or "nurture" a technology-based activity until it has reached the point of self-sufficiency, then spin it off, either as a new company, or to an existing company. ARC is developing a partnership, PACT (Partnership/Alberta for the Commercialization of Technology), with the Teknekron Corporation of California, which has been, over the last 25 years, one of the most successful companies employing this model in North America.

Teknekron, in its 25-year history, developed and sold $750M worth of companies and presently operates affiliates with annual sales of $250M. It is ARC's goal that PACT achieve comparable success in Alberta.

Improved Marketing

Marketing, at a primary level, finds and defines attractive market sectors which ARC aspires to serve. At this level, the objective is to find attractive markets which align with ARC's mission and goals, and guide the creation and implementation of strategies and plans. As discussed above, a concerted effort in this area has led to the refocusing of the ARC's activities towards the sectors listed in Section C.

At the second level, marketing identifies and characterizes important market segments within these sectors. The objective is to identify specific corporations and agencies, which are best aligned with ARC's capabilities and goals. An effort is being made in 1994/95 and will continue over the next three years to identify, using existing databases such as those in Alberta Economic Development and Tourism, all Alberta companies working in these economic sectors.

This effort will continue to:

- contact as many of these companies as possible
- outline the services and business arrangements available within ARC
- enter into fee-for-service, joint research venture or partnership arrangements to improve efficiency, or develop new products or services through the commercial utilization of technology.

Joint Ventures and Partnerships

ARC has been aggressive and innovative in forming joint ventures, partnerships, and alliances. It pioneered the Joint Research Venture (JRV) program in 1983. Through this initiative, the corporation has worked in close cooperation with more than 60 companies, many of which have experienced great success as a result of their work with ARC.

The close working relationships established through the JRV approach are much more effective in achieving successful technology commercialization than past practices of completing technology development prior to seeking private sector partners.

It is ARC's intention to increase investment in these highly successful initiatives.

Maintaining a Healthy Corporation

A. Financial Health

ARC has set goals for specific financial indices, that if maintained, will ensure corporate financial health. ARC's "Operating Equity and Cash Plan" sets $7.0M in cash and $4.0M in operating equity and reserve as desired targets for ensuring the long-term financial health of ARC.

As part of the "Operating Equity and Cash Plan", ARC will work with its departments to set target operating results for the next three years, which will ensure a healthy corporate equity balance. ARC will remain a financially strong and viable organization as it focuses on projects that provide both a return to Alberta and an adequate cash flow to ARC, and as it manages expenditures and working capital to ensure financial indices stay on target.

B. Intellectual Capabilities

Intellectual capabilities are fundamental to the success of a technology intensive corporation. The innovative capability and know-how of its staff is ARC's primary asset. In the same way ARC has taken definitive steps to manage its financial and capital assets, it is essential that the intellectual capital of the organization be equally managed.

As part of the business planning process, the key program areas of focus for ARC have been well defined. It is pivotal to ARC's success that the skill set of our employee base be continuously optimized and fully integrated with the market sectors to which ARC is aligned. All employees of ARC must have a strong commitment to life long learning and training to ensure individual success as well as the success of the corporation. It is vital that the recruitment, compensation and other human resource management practices be consistent with the program goals of the corporation.

ARC is developing a strategic human resources plan to ensure that the very best people are hired and trained for its business endeavors. This plan will recognize the importance of linkages to other sources of technology such as universities and technical institutes to position ARC as a key receptor for talented young graduates and to ensure the development and maintenance of a superior workforce. Embedded in the plan will be the fostering of a culture of entrepreneurship that sees ARC employees moving to the private sector through spin-off activities and/or through direct recruitment to Alberta based industry.

C. Facilities

A strategic facilities plan to support ARC's business strategy of focusing major efforts in certain market sectors, while phasing out core funding for a number of program areas, is being developed. This plan, to be completed in the fall of 1994, will:

- optimize ARC's businesses by rationalizing facilities
- reduce space occupied by ARC to reduce government costs
- meet ARC's program requirements over the next five years, and have the flexibility to respond to new program requirements.

This plan will be implemented by consolidating most of our programs at ARC's Mill Woods facility, while retaining high head pilot plant space, some supporting laboratories and office space at the Devon Research Centre. Operations will continue in Calgary.

Improving the Satisfaction of Stakeholders

Key to ARC being a high performing organization is ensuring a high level of satisfaction with its stakeholders - clients, employees and owner.

Clients/Partners

Baselines have been established to measure corporate performance using the Canadian Awards for Business Excellence criteria.

During 1993/94 a series of client satisfaction surveys and focus groups were conducted. Improvement programs were initiated. Continuous monitoring and initiatives to improve client satisfaction have been formalized within ARC's ongoing business practices.

Employees

An organizational climate review was conducted during the summer of 1993 to assess the current level of employee satisfaction and provide input to planning organizational improvement in human resources and business practices. This survey is carried out on an annual basis to measure employee satisfaction.

Key performance improvement initiatives are under way. As part of ARC's Total Quality initiative, an Integrated Business System (IBS) has been developed and is in the process of being implemented throughout the corporation. This system is designed to align the daily practices of the organization with the corporate mission and vision. It provides a framework to describe how the corporation will measure its success based on the corporate vision and mission, and how the daily activities of every individual contribute to this vision and mission. Every employee has completed a roles and responsibilities worksheet describing projects and processes they are responsible for leading, or ones in which they participate. This system is being fully automated so that it is easily maintained and updated. It has built-in continuous monitoring and improvement processes, as well as communication protocols.

Owner

To date there has been no attempt to formally assess owner satisfaction as represented by the Board of Directors. Plans are under way to obtain baseline information on the level of satisfaction of board members, and other representatives of the 'owner' so that improvements can be made as required.

9.10.7 Financial Plan

ARC's three-year plan forecasts that overall revenues will decrease from $41.9M in FY1994/95 to $37.6M in FY 1997/98 (10.3% decrease). This is exclusively due to the very large decrease in revenues forecast from Alberta provincial government sources (core funding and contract funding). Revenues from provincial government sources are forecast to decrease from $26.8M in FY 1994/95 to $21.0M in FY 1997/98 (21.6% decrease). During the same period, revenues from nonprovincial government sources (primarily industry), are forecast to increase from $15.1M in FY1994/95 to $16.6M in FY 1997/98 (9.9% increase). As a result, by FY1997/98, more than 44% of all ARC revenues will be from nonprovincial government sources.

The refocus of ARC's businesses discussed in the following sections will result in staff reductions from 473 at the beginning of 1994/95 to approximately 370 by 1997/98.

Table 9.10.2 Alberta Research Council
Three Year Financial Plan Statement of Revenue, Expenditure and Equity

	Actual 1993-94	Forecast 1994-95	Plan 1995-96	Plan 1996-97	Plan 1997-98
Provincial Revenue					
Core funding	$24,629	$22,547	$21,037	$19,527	$19,527
Contracts	6,453	4,236	1,500	1,500	1,500
	$31,082	$26,783	$22,537	$21,027	$21,027
Other Revenue					
Industry contracts	18,046	14,245	15,000	15,000	15,000
Royalties and licensing fees	0	836	1,045	1,350	1,600
	$18,046	$15,081	$16,045	$16,350	$16,600
	$49,128	$41,864	$38,582	$37,377	$37,627
Sources of Revenue					
Non-Alberta Government	36.7%	36.0%	41.6%	43.7%	44.1%
Alberta Government	63.3%	64.0%	58.4%	56.3%	55.9%
	100.0%	100.0%	100.0%	100.0%	100.0%
Expenditure					
Salaries, wages and benefits	28,410	24,705	22,736	22,013	22,163
Severance costs	1,284	1,000	1,079	396	0
Supplies and services	14,840	14,350	11,549	11,245	11,781
Capital assets	3,693	3,837	3,969	3,735	3,694
	$48,227	$43,892	$39,333	$37,388	$37,638
Revenue over expenditure (deficiency)	901	(2,028)	(751)	(11)	(11)
Transfer from (to) reserve	2,198	735	600	600	600
Operating equity at beginning of period	3,856	4,017	2,724	2,573	3,162
Operating equity before pension liability and reserve	6,955	2,724	2,573	3,162	3,751
Prior period pension liability	(2,938)	0	0	0	0
Operating equity before reserve	4,017	2,724	2,573	3,162	3,751
Reserve	2,802	2,067	1,467	867	267
Operating equity and reserve at end of period	$6,819	$4,791	$4,040	$4,029	$4,018

ALBERTA RESEARCH COUNCIL
Distribution of Core Funding ($ in Millions)
1995/96

Department	R&D
Manufacturing	4.0
Forest Products	0.6
Pulp and Paper	0.6
Biotechnology	2.3
Information Technologies	4.6
Energy Breakthrough Technologies	2.6
Energy Technologies	2.7
Environmental Technologies	3.6
TOTAL	21.0

9.11 ALBERTA TRANSPORTATION AND UTILITIES

9.11.1. Executive Summary

This document covers the accomplishments of the 1993/94 program in departmental research and technology transfer services; the details of the proposed 1995/96 program; a general outline of the proposed program for 1995/96-1997/98 and the proposed departmental science and technology budget for 1995/96-1997/98 and future outlook.

9.11.2 Foundation

Alberta Transportation & Utilities has developed an extensive transportation infrastructure over the years. This infrastructure is used and operated, planned and maintained by thousands of Albertans and numerous commercial enterprises on which the province's economy, facilities and communities rely. The highway system reflects some $12 billion of provincial investment over many years.

The province has 13,500 kilometres of primary highways of which over 1,500 kilometres are twinned, over 15,000 kilometres of secondary highways and over 125,000 kilometres of local roads. This extensive network is necessitated by the settlement and economic development patterns which cover much of the province. Other provinces do not have a similar broad pattern of development, particularly in northern regions.

The Department is the road authority for the primary highways, with responsibilities for their capital improvement, rehabilitation, maintenance and motor transport safety services. These highways, servicing interregional, interprovincial and international trade and travel, are critical to Alberta's economic competitiveness. Secondary highways in rural areas and major arterial (highway extensions) in cities are under local jurisdiction; the Department provides capital assistance. These provincial-municipal partnerships ensure that Alberta's major roadways are planned and developed as an overall system to efficiently and safely move people and goods.
In addition, there is a network of 17 provincial airports and 65 community airports (not including Edmonton Municipal).

Mission

The mission of Alberta Transportation and Utilities is to ensure that Albertans are served by a safe, efficient transportation system and essential utility services necessary for a prosperous economy and good quality of life at an affordable cost.

Goals

The Department's goals are:

1. To meet basic customer service expectations for safety and convenience, timeliness and cost.

2. To protect the public's investment in the transportation and utilities' infrastructure.

3. To identify and eliminate factors contributing to accidents in the operation of the transportation and utilities' systems.

4. To increase opportunities to operate on a business-like user-pay basis:
   - securing funds from a range of sources;
   - applying funds to give the best return for meeting demonstrated public needs and government priorities.

5. To expand partnerships with other governments, the private sector, rural utility co-operatives and others.

6. To evaluate every service to have it delivered by the best cost and most effective supplier.

7. To improve the value of those services performed directly by the Department.

8. To prepare our people for managing and leading change.

Departmental research and technology transfer services directly support the Departmental goals, are commensurate with the reduced departmental budgets, yet provide the opportunity for improved departmental efficiency and effectiveness by the introduction of better performing materials, processes, techniques and innovations.
More specifically the Department's technology transfer and applied research programs aim directly at improving development, maintenance and operation of the transportation physical plant in the province (highways, roads, bridges, and airports) and departmental equipment through:

- Provision of technology transfer mechanisms for the capture and dissemination of new processes, technologies and techniques.

- Ensuring that technology transfer occurs internally within the Department as well as with the external environment.

- Coordinating all departmental research to ensure it is designed, documented and followed through according to a scientific approach.

- Avoiding duplication of research effort throughout the department.

- Exploring opportunities for cooperative research and technology transfer.

- Undertaking certain research projects directly.

The program encompasses the following functional areas:

- Internal Component

- Cooperative Component

- Technology Transfer Component

9.11.3 Programs, Products and Services

1995/96 FISCAL YEAR PROPOSED PROGRAM

PROPOSED 95/96 INVESTMENT ($MILLION)	R&D	RSA*	TOTAL
	0.615	0.577	1.192

** Related Scientific Activities (RSA) are defined as activities supporting R&D such as technical surveys, education support, technology transfer and information services, standards and development etc.*

The 1995/96 proposed program is a continuation of the 1994/95 program which directly supported the departmental goals outlined earlier. The 1994/95 budget was down considerably, $125,000 from the 1993/94 budget, to a level of $1.271 million. Benefits to the department from the 1994/95 program are expected to be similar to those in 1993/94 and the program is progressing satisfactorily, though with some reassignment of priorities.

The 1995/96 program will continue to have the three components, internal, cooperative and technology transfer, though the budget will be reduced by another $79,000 to $1.192 million and will be supported by 13 staff, down one from the previous year.

To date the needs identified in the following pages for the total 1995/96 program require a budget of $1.315 million, a shortfall of $123,000 compared to the available 1995/96 budget.

The 1995/96 proposed program outlined here will have to be tailored accordingly, at a later date, to fit the available budget.

Internal Component 1995/96

ACTIVITY DESCRIPTION	COST ($)
Materials improvement	56,000
Bridges and Culverts	1,000
Environmental Aspects	22,000
Maintenance Improvement	7,000
Intelligent Vehicle Highway Systems (IVHS)	27,000
Global Positioning System (GPS) Applications	95,000
Standards and Specifications	9,000
Safety	1,000
Administration	10,000
Salaries and Benefits	305,500
TOTAL	**533,500**

Cooperative Component 1995/96

PROGRAM DESCRIPTION	DEPARTMENT SHARE ($)	OTHER PROVINCES SHARE ($)	FEDERAL GOVERNMENT SHARE ($)	INDUSTRY SHARE ($)	TOTAL ($)
Canadian Strategic Highway Research Program (C-SHRP)	34,000	343,000	38,000		415,000
Cooperative Research Through Transportation Association of Canada (TAC)	24,000	235,300	194,600		453,900
Surface Water Research	75,000			75,000	150,000
Pavements Performance Research	110,000			110,000	220,000
Administration	10,000				10,000
SUB TOTAL	253,000	578,300	232,600	185,000	1,248,900
SALARIES & BENEFITS	262,000	Not Known	Not Known	N/A	
TOTAL	515,000				1,248,900

Technology Transfer Component 1995/96

ACTIVITY DESCRIPTION	COST ($)
Technology Transfer within the Department	32,000
Technology Transfer from Outside Sources	3,000
Technology Evaluation for Adoption	35,000
Administration	11,000
Salaries and Benefits	185,000
TOTAL	**266,000**

Planning & Coordination of Program

The internal component and the technology transfer component have their needs identified by the operational parts of the department. These needs are then compiled and addressed in the following years. Sufficient flexibility is maintained to address very urgent needs throughout the year without having to wait for the next yearly cycle. The cycle is as shown in figure 9.11.1

Cooperative research at the provincial level has been conducted with other departments or cities, e.g. Environmental Protection, Fish & Wildlife, Alberta Research Council, City of Edmonton & Calgary. The arrangements are negotiated with the other party on a project to project basis. Most cooperation with the private sector results from joint venturing in the development of specific equipment or process.

Cooperative research at the national or interprovincial level is usually negotiated through the Research & Development Council of the Transportation Association of Canada (TAC) on an ongoing basis. Occasionally on a specific project basis it is negotiated directly with Transport Canada, the National Research Council, or other institutes like the Forest Engineering Research Institute of Canada (FERIC).

Cooperative research at the international level is negotiated through TAC. Some examples are participation in the $150 million United States Strategic Highway Research Program (SHRP), and participation in beneficial OECD projects.

1995/96 - 1997/98 FISCAL YEARS PROPOSED PROGRAM

	1995/96 $ million	1996/97 $ million	1997/98 $ million
ANTICIPATED BUDGET	1.192	1.129	1.069

Based on the needs of the department identified so far, the program requirements for the three components are estimated as shown below. The requirements exceed the expected budgets and will therefore have to be adjusted accordingly in the future.

	ACTIVITY	1995/96 ($)	1996/97 ($)	1997/98 ($)
INTERNAL COMPONENT	Materials Improvement	56,000		
	Bridges and Culverts	1,000		
	Environmental Aspects	22,000		
	Maintenance Improvements	7,000		
	IVHS Applications	27,000		
	GPS Applications	95,000		
	Standards and Specifications	9,000		
	Safety	1,000		
Total		218,000	190,000	200,000
COOPERATIVE COMPONENT	C-SHRP Implementation	34,000		
	TAC	24,000		
	Surface Water	75,000		
	Pavement Performance	110,000		
Total		243,000	233,000	223,000
TECH TRANSFER COMPONENT	Technology Transfer Within	32,000		
	Technology Transfer from Outside	3,000		
	Technology Evaluation	35,000		
Total		70,000	57,000	50,000
	Administration	31,000	30,000	30,000
	Salaries and Benefits	753,000	713,000	648,000
	TOTAL	**1,315,000**	**1,223,000**	**1,151,000**

Internal Component

- Consistent with doing more for less improvements in asphaltic concrete and portland cement concretes must be sought to provide better and longer lasting pavements and bridge structures.

- Deterioration of bridges and culverts requires methods to prevent deterioration and better ways of rehabilitation.

- The thrust in environmental aspects will be erosion control, alternate de-icing compounds to common salt, and wildlife control.

- With the department slowing down on capital construction and increasing the emphasis on maintaining the existing highway infrastructure much work needs to be done in improving cracksealing, patching and general maintenance practices.

- In support of agreements like NAFTA, intelligent vehicle highway systems adaptation to commercial vehicle operations is necessary to improve Alberta's competitiveness and efficiency.

- GPS applications for surveying and data gathering are at their peak and will slow over the next two years as the use of these systems becomes routine within the department.

- Much work needs to be done to test new concepts and procedures before they are applied as new or improved standards.

- Vehicle and occupational safety of our work force on the highways continually requires testing of new devices, warning systems and practices.

Cooperative Component

- On April 1, 1994 the C-SHRP follow on program into pavements, asphalts, structures and highway operations was started and funded for a period of five years. This program will implement at the national and local levels the research results of Canadian C-SHRP program ($6 million) and the U.S. SHRP program ($150 million) which have just finished.

- Through the Research & Development Council of the Transportation Association of Canada cooperative research will be conducted that is beneficial to all provincial departments of transportation.

- Surface water research is long term, looking into various aspects of scour, bank protection, ice mechanics and hydrology to improve the design and protection of bridges.

- Pavement performance research is long term, investigating pavement design and evaluation, improving pavement management system's models and investigating seasonal variation in truck loading.

Technology Transfer Component

- Technology transfer within the department aims at disseminating and implementing into general practice research and technological innovations developed within the department. This is done through demonstrations, workshops, audio-visual media and publications.

- Technology transfer from outside aims at introducing and adapting technologies and processes that exist in the external environment, to our problems and needs.

- Many evolving technologies can be adapted to our operations to improve our efficiency (e.g. electronic contract bidding system) but need to be harnessed and adapted to our needs.

9.11.4 Measurable Results

1993/1994 PROGRAM ACCOMPLISHMENTS

93/94 INVESTMENT ($MILLION)	**R&D**	**RSA***	**TOTAL**
	0.72	0.676	1.396

** Related Scientific Activities (RSA) are defined as activities supporting R&D such as technical surveys, education support, technology transfer and information services, standards and development etc.*

Internal Component $ 0.867 million

The Internal component is defined as activities conducted internally with the Department by its staff or that which is administered by departmental staff but contracted out to the private sector or universities.

Some highlights of this component in 1993/1994 were:

- Bridge Deck Service Life Prediction Model Development

  There has been no established method to predict the service life expectancy of bridge decks under specific site conditions. This project was established to develop a model that can be used as a tool to better estimate the life expectancy of specific bridge decks within the overall bridge management system. Based on the work done in 1993/94 which will be completed in 1994/95 the rehabilitation of these infrastructure elements on a timely basis will ensure that in future, funds are allocated in the most cost-effective way.

- Portable Rumble Strips

  Safety has always been a concern for our field workers, whether doing road repairs or maintenance activities on the highway. They are constantly exposed to the hazards of highway traffic. In 1992, accidents involving errant vehicles driving into identified work zones resulted in two fatalities. A properly designed rumble strip can provide a sufficient jolt and audible noise to safely alert motorists of danger ahead. Different designs of portable rumble strips were evaluated for their effectiveness and user acceptability in the 1993 construction season. Several designs will be used routinely in 1994 onwards.

- Load Distribution Slabs over Culverts

  Traditional methods of installing culverts involve placing fill over the pipe to form a soil arch. This fill, which is typically 1.5-2 times the major diameter of the pipe being covered, allows stress to be distributed away from the pipe into the surrounding soil. In certain configurations a very large pipe is required to transmit the full stream flow, but it is not always possible to provide the required height of fill in order to create the soil arch effect. In the case of the culvert tested in 1993/94 a concrete slab completely replaced the soil fill. This configuration was instrumented and showed that in the future we can reduce overdesign and provide more cost effective designs without compromising safety.

- Integrated Global Positioning System (GPS)/Videolog Van

  The objective was to develop a replacement videolog system capable of recording high resolution roadway pictures, accurately tagging these pictures to the GPS location reference system. The position database would be available for uploading to a future departmental geographic information system (GIS).

  The components purchased in 1992/93 were integrated and installed with appropriate software in 1993/94. Testing carried out indicates that a fully functional van will now be operating in the 1994/95 summer season.

  The videolog inventory will save department staff many field trips in carrying out their planning, design or operational analyses. According to previous videolog usage statistics, the savings of not taking field trips amounted to over $150,000 annually. The additional GPS/GIS linkage will become very important once the department implements a GIS management scheme.

Cooperative Component $0.375 million

The Cooperative component are activities where joint funding with other partners provides the opportunity to address common problems at significantly reduced cost to the department.

Some highlights of this component were:

- C-SHRP/SHRP Program

  The department participated in the sixth and last year of Canadian Strategic Highway Research Program (C-SHRP), where for our contribution of $340,000 over the total period, we had access to the $6,000,000 C-SHRP program (leverage ratio 18:1) and the $150,000,000 U.S. SHRP program (leverage ratio 570:1). Both SHRP and C-SHRP are programs researching asphalts, pavements, highway operations, and concrete structures. A new program starting in 1994/95 will look at implementing the results in the field.

- Low Volatile Organic Compound (VOC) Coatings for Bridge Applications

  Many of the bridge paints and coatings used to date contain lead or volatile carriers which are no longer acceptable for environmental reasons. Identification and utilization of low VOC coatings will protect the environment and ensure compliance with National and Provincial regulations. Under a cooperative venture with other DOTs, cities and paint suppliers a testing laboratory was contracted to evaluate candidate low-VOC paint systems for performance and future use by the department. In the process of testing the samples, a paint approval process was developed. The benefits of this research started in 1993/94 are both environmental and economical.

- Petrographic Test Procedure for Alberta based Aggregates

  Petrographic analysis is used by the Department to determine the quality of aggregates used in bridge construction projects. Local testing labs have produced inconsistent test results in the absence of a standard petrographic test procedure based on Alberta aggregates. In cooperation with Alberta Research Council current petrographic test procedures were reviewed and the necessary changes were made to produce more consistent results. The benefits of the standard petrographic test produced will result in better quality control of concrete aggregates and improved concrete performance.

- Feasibility of Recycled Tire Rubber in Asphalt Pavements

  Efforts to reuse rubber tires have intensified in recent years as the result of environmental problems associated with the storage and disposal of waste tires. A study was initiated between AT&U, EBA and the Cities of Calgary and Edmonton to document the technical and economic feasibility of incorporating recycled tire rubber (RTR) into asphalt mixes in Alberta. The scope of the program was to assess the use of RTR asphalt mixes in the laboratory and conduct a literature search on RTR research in general. The results showed that there is a premium cost to be paid for incorporating RTR into the mix and not much likelihood of superior performance.

Technology Transfer Component $0.154 million

Technology Transfer promotes, communicates and disseminates internal research results and technological innovation throughout the department. It also harnesses for departmental implementation research and innovation results from other external agencies and suppliers.
Some highlights of this component were:

- INFOSPON

  During 1993/94 a micro computer based system, INFOSPON, was implemented across the department. This system contains up-to-date information on all ongoing departmental research, all publications on research and all products tested by the Department (close to 900 entries). This system shares information with all staff in the department, avoiding duplication of research effort and testing of the same products by different areas of the department.

- AT&U Technology Transfer Workshop, Transearch & Technical Flash

The workshop was held in February 1994 and was acclaimed as the best of the four put on so far. It is a forum, for presentation and dissemination to others in the department, of new processes, techniques and innovations. This is also supplemented by 3 publications yearly of Transearch, whose aim is much the same. In 1993/94 the Technical Flash was introduced - a one page, double sided colour document, that is distributed widely in the department and provides information, specifications and applications of newly completed research and innovation.

Proposed Program Evaluation

Research activities depicted in this plan support departmental needs, goals and objectives. The department supports provincial, government, economic and social needs by continuously trying to provide a better, safer and more efficient transportation system in the province, which in turn provides direct benefits to the economy of the province and the provincial taxpayer. Even so, research conducted cannot always be measured by benefit/cost in actual dollars. Certainly much of the research does provide a considerable measurable dollar return by providing better materials for construction or maintenance, or more efficient processes through which manpower or time can be reduced. In evaluating research programs and projects a much broader perspective must be taken than dollars and cents. Research projects whose benefits are hard to quantify in dollars, often have other benefits. Some examples may be safety, environmental, societal aspects while others may be to support establishment of policy, regulations and legislation. Even research that fails has a value (e.g., getting to know that a tested product has deleterious effect on concrete bridges, which in turn would shorten the expected life of the structure). Only by looking at all these benefits simultaneously can an objective evaluation of research be made.

With these points in mind, the following evaluation of research is proposed starting 1 April 1994.

- Internal Client Evaluation

  All research projects are conducted for departmental clients. At the end of each project the client will formally evaluate the research as to whether it met his needs and he will identify and limitations or further requirements.

- External Evaluation

  An external evaluation involving public participation be conducted every three years. A three year cycle is proposed because of the nature of research. There are highs and lows, and three years will provide a better measure of the mean.

  Research projects fall into various technical research areas (TRA), e.g. pavements, bridges, highway operations, equipment, safety, etc. It is proposed that for each TRA a three person expert group be established as follows:

  - The research project coordinator
  - The research project client
  - Member from the private sector, knowledgeable in the subject matter.

The appropriate expert group will evaluate each research from the broad perspective described previously.

The evaluations of all the expert groups will be combined to provide an overall program evaluation.

9.11.5 Human Resources

Human resources are expected to reduce by 18% over the time period. Training and development will be given as circumstances and projects warrant.

9.11.6 Financial Plan

PROPOSED DEPARTMENTAL SCIENCE AND TECHNOLOGY BUDGET (S&T) 1995-1998

FUNCTION	1995/96 R&D ($Million)	RSA	1996/97 R&D ($Million)	RSA	1997/98 R&D ($Million)	RSA
Departmental Research & Technology Transfer Services	0.615	0.577	0.582	0.580	0.551	0.549
Bridge Engineering	0.0	0.033	0.0	0.031	0.0	0.029
Roadway Planning	0.0	0.836	0.0	0.794	0.0	0.754
Roadway Engineering	0.109	0.779	0.104	0.740	0.099	0.703
Contracts Engineering	0.0	0.100	0.0	0.095	0.0	0.090
Technical Services	0.257	1.338	0.2442	1.271	0.232	1.207
Motor Transport Services	0.0	1.060	0.0	1.007	0.0	0.957
TOTAL	0.981	4.723	0.9302	4.518	0.882	4.289
GRAND TOTAL	**5.704**		**5.448**		**5.171**	

Besides the research and technology transfer services described in the previous part of this document, the department conducts many other activities in support of its mandate that are considered by some to have a loose connection to R&D and RSA. This section includes those activities as well under the general heading of S&T.

- Departmental Research and Technology Transfer Services

  Represent the activities depicted in "1995/96 - 1997/98 fiscal years proposed program" - pages 13-16

- Bridge Engineering

  Represents surveys to determine scour in river beds so as to maintain bridge structure integrity and to ensure public safety.

- Roadway Planning

  Almost entirely technical surveys of existing and proposed highway infrastructure, including long range planning for right-of-way requirements.

-

Roadway Engineering

A modest sum is spent on geometric standards and materials research, however, the majority is for quality control during construction, technical surveys for pavement structural design, assessing pavement condition and performance for planning rehabilitation and reconstruction needs.

- Contracts Engineering

Mainly involves special projects to assess the environmental impact of highway systems to protect historical and biophysical resources.

- Technical Services

Primarily technical acquisition of traffic volume statistics and videolog of highways needed to design and improve the highway system due to increasing traffic volumes.

- Motor Transport Services

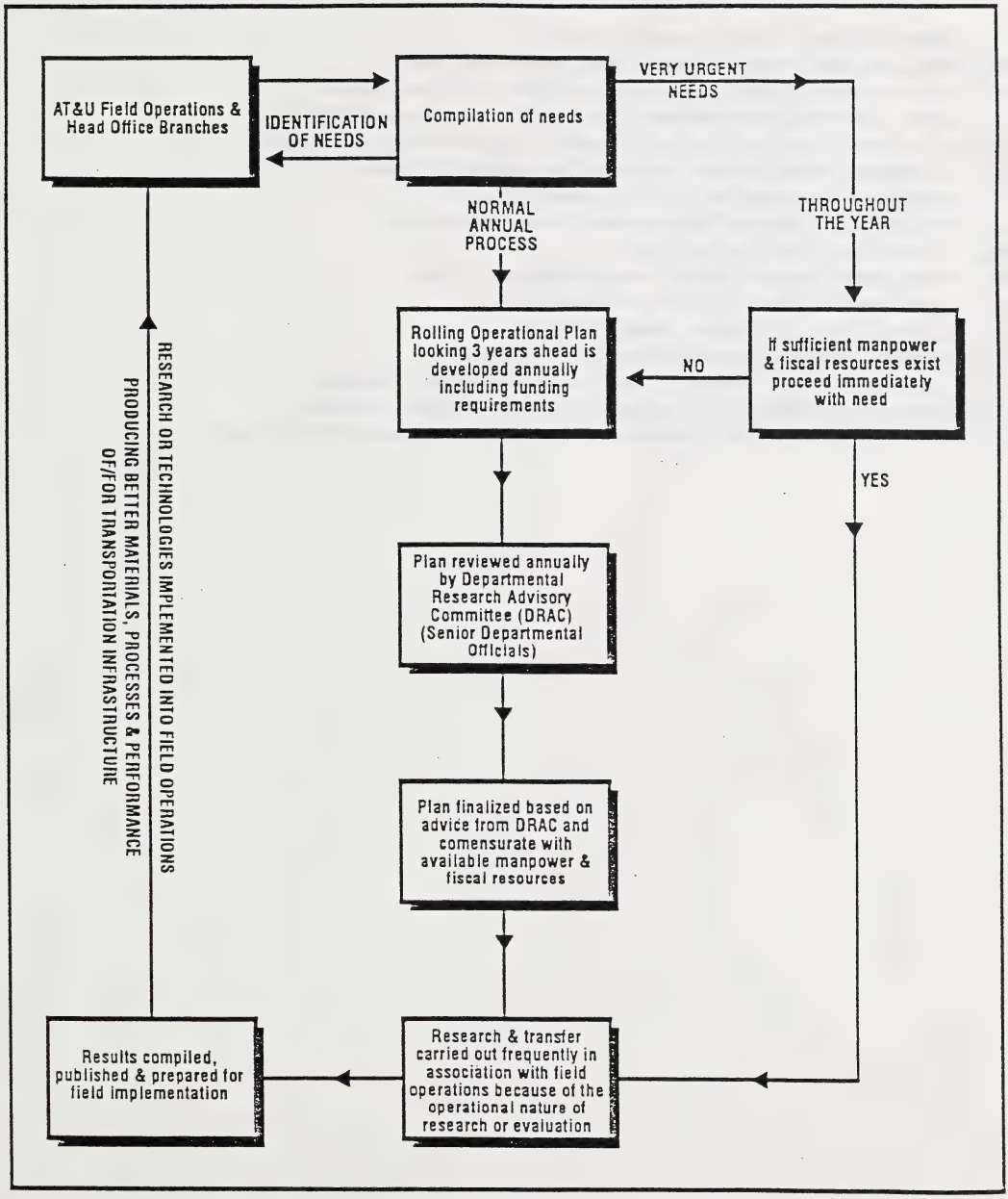
Primarily technical surveys related to transportation safety, accident analysis and infrastructure damage assessment to improve highway safety, protect against potential liability claims and provide convenience to the motoring public.

Program Outlook

During the 1995/96 - 1997/98 period the S&T program is likely to decrease by over half a million dollars and tending more to support maintaining the current infrastructure through increased maintenance, rehabilitation and reconstruction rather than new capital construction.

In the longer term, the S&T budgets will proportionally follow the departmental budget, with activities supporting the maintenance of the highway infrastructure and improving the effectiveness and efficiency of the highway system and that of its users through application and adaptation of new technologies. (e.g. Intelligent vehicle highway systems to aid the trucking industry and to decrease congestion on high volume routes)

Figure 9.11.1 Planning and Coordination of Program


AT&U Field Operations & Head Office Branches
IDENTIFICATION OF NEEDS
Compilation of needs
VERY URGENT NEEDS
NORMAL ANNUAL PROCESS
THROUGHOUT THE YEAR
Rolling Operational Plan looking 3 years ahead is developed annually including funding requirements
NO
If sufficient manpower & fiscal resources exist proceed immediately with need
YES
Plan reviewed annually by Departmental Research Advisory Committee (DRAC) (Senior Departmental Officials)
Plan finalized based on advice from DRAC and comensurate with available manpower & fiscal resources
Research & transfer carried out frequently in association with field operations because of the operational nature of research or evaluation
Results compiled, published & prepared for field implementation
RESEARCH OR TECHNOLOGIES IMPLEMENTED INTO FIELD OPERATIONS
PRODUCING BETTER MATERIALS, PROCESSES & PERFORMANCE OF/FOR TRANSPORTATION INFRASTRUCTURE

Appendix 1

A. Technology and Research Advisory Committee

Dr. B. Barge, President, Alberta Research Council
Mr. J. Bell, Associate Director, Federal & Intergovernmental Affairs
Dr. W. Byrne, Assistant Deputy Minister, Alberta Community Development
Mr. P. Crerar, Assistant Deputy Minister, Economic Development and Tourism
Dr. R. G. Christian, Executive Director, Agriculture Food and Rural Development
Mr. C. L. Dmytruk, Senior Director, Economic Development & Tourism
Dr. R. Fessenden, Vice-President, Alberta Research Council
Mr. P. Hill, Director, Advanced Education and Career Development
Mr. J. K. Kleta, Executive Director, Energy
Mr. J. Konarzewski, Director, Alberta Transportation and Utilities
Ms. C. Lord, Assistant Deputy Minister, Alberta Health
Dr. R. Luhning, Executive Director, Alberta Energy
Ms. B. Nyland, Director, Science and Research Secretariat
Dr. C. Reichert, Secretary, Technology and Research Advisory Committee
Dr. M. Spence, President, Alberta Heritage Foundation for Medical Research
Dr. M. Wilson, Director, Alberta Environmental Centre, Alberta Environmental Protection

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